BY AUTHORITY

ORDINANCE NO. 152 COUNCIL BILL NO. 135

SERIES OF 2008 COMMITTEE OF REFERENCE: Blueprint Denver Safety

A BILL

For an ordinance relating to Chapter 10 (Buildings and Building Regulations), Denver Revised Municipal Code, modifying Section 10-16 (Building and fire code adopted).

BE IT ENACTED BY THE COUNCIL OF THE CITY AND COUNTY OF DENVER:

Section 1. Section 10-16 (dealing with the adoption of the building and fire codes), of Chapter 10 (Building and Building Regulations), DRMC shall be amended by deleting the language stricken and adding the language underlined below to read and be read as follows:

Sec. 10-16 The International Building Code ("IBC"), International Energy Conservation Code ("IECC"), the International Fire Code ("IFC"), the International Fuel Gas Code ("IFGC"), the International Mechanical Code ("IMC"), the International Plumbing Code ("IPC"), and the International Residential Code ("IRC"), all series of ~~2003~~ 2006 and all amendments thereto and ~~t~~The ~~a~~Administration of the Denver Building Code, all as filed ~~May 21, 2004~~ March 13, 2008 in City Clerk File Number ~~04-421~~ 08-256 are hereby adopted collectively as the Denver Building and Fire Code.

COMMITTEE APPROVAL DATE: 9/18/2007.

MAYOR-COUNCIL DATE: 3/11/2008.

PASSED BY THE COUNCIL March 24 2008

[signature] - PRESIDENT

APPROVED: [signature] - MAYOR March 25, 2008

ATTEST: [signature] - CLERK AND RECORDER, EX-OFFICIO CLERK OF THE CITY AND COUNTY OF DENVER

NOTICE PUBLISHED IN THE DAILY JOURNAL Mar. 21, 2008; Mar. 28, 2008

PREPARED BY: Timothy J. Carrier, Assistant City Attorney 3/11/2008

Pursuant to section 13-12, D.R.M.C., this proposed ordinance has been reviewed by the office of the City Attorney. We find no irregularity as to form, and have no legal objection to the proposed ordinance. The proposed ordinance is not submitted to the City Council for approval pursuant to § 3.2.6 of the Charter.

David R. Fine, City Attorney

BY: [signature] Asst City Attorney Date 13 Mar 08

AMENDMENTS

TO THE

BUILDING CODE

FOR THE

CITY AND COUNTY OF DENVER

DENVER
THE MILE HIGH CITY

ACKNOWLEDGEMENT

The review of the International Codes developed by the International Code Council (ICC) was performed in response to concerns expressed on behalf of the construction and development industries, businesses, design professionals, educational institutions, local government, affordable housing and most of all the citizens of Denver.

The ICC Codes and the National Fire Protection Association (NFPA) Codes are written to meet the needs of a variety of jurisdictions and need to be fine-tuned to address the specific needs of the City and County of Denver.

As a result, the Building Code Revision Committee (BCRC), a group of highly qualified individuals who have demonstrated knowledge and competence in the design and construction of buildings and structures developed these amendments. These individuals participated in the testing of building components and systems, the investigation of fires and explosions and in the enforcement of regulations pertaining to life-safety issues from fires, explosions and other hazards encountered in buildings and structures. This committee went through this process to recommend the adoption of the 2006 Series of I-Codes.

The committee members have produced a comprehensive set of effective amendments that directly affect safety to life within the City and County of Denver. As a result, these Amendments to the 2006 International Building Code and International Fire Code were adopted.

We wish to acknowledge the members of Denver's City Council, the Mayor's Office, City Attorney's Office, Fire Department, Building and Construction Services of Community Planning and Development, the Building Code Revision Committee, its subcommittees and the organizations they represented for the time, dedication and professionalism devoted to the development of this document.

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Tim Carrier, Esq.	City Attorney's Office

An expression of sincere thanks is extended to the above individuals who have contributed assistance and counsel in the development of Denver's Building and Fire Codes. The committee members gave time away from their responsibilities and livelihood to serve as volunteers in this effort. The net result is a major contribution toward preserving our well-being and property by providing a safe environment for the welfare of the people who live, work and visit the City and County of Denver. In particular, we also wish to thank Diane Barrett of the Mayor's Office for her assistance and guidance.

John W. Hickenlooper
Mayor
City & County of Denver

Peter Park
Manager
Community Planning and Development

Nick Nuanes
Chief
Denver Fire Department

Alvin J. LaCabe, Jr.
Manager of Safety
Denver Department of Safety

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DENVER AMENDMENTS TO THE ADMINISTRATION OF THE 2006 DENVER BUILDING CODE

CHAPTER 1
ADMINISTRATION

SECTION 101
PURPOSE AND SCOPE

101.1 Title. The title of this Ordinance shall be, and this Ordinance shall be cited, the Building Code of the City and County of Denver, and referred to hereinafter as the Code.

101.2 Purpose. The purpose of this Code is to provide minimum standards to safeguard life, health, property and public welfare by regulating and controlling the design, construction, quality of materials, use, occupancy, location and maintenance of all buildings and structures within the City and County of Denver (hereinafter "City"), and certain equipment specifically regulated herein.

101.3 Scope. The provisions of this Code shall apply to and govern the following:

101.3.1 New Buildings, Structures and Utilities. The Code shall regulate the construction, addition, alteration, repair, occupancy, use and maintenance of any building, structure or utility hereafter erected within the City, except as set forth in subsection 101.3.3 below.

101.3.2 Existing Buildings, Structures or Utilities. The Code shall regulate the alteration, addition, repair, demolition, removal, moving, change of occupancy and maintenance of any existing building, structure or utility heretofore erected within the City.

101.3.3 Buildings, Structures and Utilities not Regulated by this Code. The Code shall not regulate the following work.

1. Work located primarily in the public way unless specifically provided for by this Code.
2. Public utility towers, poles and mechanical equipment used for the production, generation or distribution of the utility product or service through the facilities owned and operated by the utility company to the point of customer service.
3. RTD Light Rail construction on RTD right-of-way. Traction power substations, signal/communication relay cases and housing, associated conduit and wiring for the operation of the light rail lines and the construction of the station platforms.

Refer to Section 150.1.1 for additional exempt work.

101.3.4 Most Restrictive. Where in any specific case the requirements of different sections of this Code vary, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable. Where there is a conflict between the provisions of this Code and any other legally adopted city ordinance, the most restrictive shall govern.

101.3.5 Transition Rules. This Code and implementation of all its provisions and policies shall become effective as follows:

101.3.5.1 Effective date. The effective date of the new Code shall be four months after the date of the adopting ordinance to the International Building Code, International Fuel Gas Code, International Energy Conservation Code, International Plumbing Code, International Residential Code and the International Mechanical Code; including amendments.

Amendments to the National Electric Code: the date of the adopting ordinance.

101.3.5.2 Continued use of the 2004 Denver Building Code. The option of the use of the 2004 Denver Building Code or the new Code shall be allowed for any projects that will be submitted to the Agency after the adopting ordinance and before the effective date of this Code.

Major projects in the design stage during the drafting of the new Code that will be submitted to the Agency after the effective date of this Code may be reviewed under the 2004 Denver Building Code. Provided that the owner or the owner's agent submits a letter of commitment to the Agency stating:

1. Election to proceed under the 2004 Denver Building Code or this Code;

2. Address of the construction project;
3. Description, number of stories, floor area, occupancy, etc., of the building;
4. Date of beginning design drawings;
5. Date of submitting construction drawings to the Agency.
6. That the construction of the project will start within 6 months and be completed within 24 months of the effective date of this Code if the option is to use the 2004 Denver Building Code.

A letter of commitment must be submitted by the effective date of this Code.

101.3.5.3 Type approved. "Type approved" structures approved by the Agency prior to the effective date of the new Code are valid for permitting until 6 months after the effective date of the new Code.

SECTION 102
ORGANIZATION OF BUILDING PERMITTING AND INSPECTION SERVICES

102.1 Creation of administering agency. The administrative agency (hereinafter "Agency") responsible for administering and enforcing the Code shall be established under the Manager of Community Planning and Development.

102.2 Building Official. The Manager of Community Planning and Development shall appoint the Building Official. The Building Official is hereby authorized and directed to interpret and enforce all provisions of this Code.

102.3 Employees. In accordance with prescribed procedures, the Building Official shall authorize or appoint engineers, technicians, inspectors or other employees to perform duties and exercise powers delegated to the Building Official by this Code.

102.4 Authorization and Identification. Each employee of the Agency shall be provided with an identification card bearing information required by the Building Official. This card shall be carried by the person identified, and shall be displayed when necessary to identify the person properly to perform official duties.

SECTION 103
GENERAL POWERS AND DUTIES OF THE AGENCY

103.1 Powers and Duties. This Agency shall administer and enforce this Code and all other ordinances, which are or may be assigned to the Agency for enforcement and administration. The Agency is vested with the duties of enforcing and administering this Code, and the power necessary for such enforcement.

103.2 Interpretations, Rules and Regulations. The Building Official shall have the full power to render interpretations of this Code and to adopt and enforce Rules and Regulations supplemental to this Code, as may be deemed necessary in order to clarify the application of Code provisions. Such interpretations and Rules and Regulations shall be in conformity with the intent and purpose of this Code. Rules and Regulations shall be adopted and recorded in accordance with the provisions of the Revised Municipal Code. The Board of Appeals may review any appeal of an Agency interpretation subject to Section 113 Appeals.

103.3 Modifications Under Special Circumstances. Whenever there are practical difficulties involved in carrying out the provisions of this Code, the Building Official may grant modifications for individual cases, provided the Building Official shall first notify the owner of the building, structure or utility and then find that a special individual reason makes the strict letter of the code impractical and that the modification is in conformity with the intent and purpose of this Code and that such modification does not lessen any fire protection requirements or any degree of structural integrity. The details of any action granting modifications shall be sent to the owner and entered in the permit files of the Agency.

103.4 Authority to Inspect. The Agency shall have the authority to inspect or cause to be inspected all buildings, structures or utilities for compliance with this Code.

103.5 Investigations and Surveys. Incidental to any of these duties and powers, but without limitation of the same, the Agency may conduct investigations or surveys to determine compliance or noncompliance with the provisions of this Code; and further may investigate or cause to be investigated all accidents pertaining to buildings, structures or utilities.

103.6 Right of Entry. Whenever an authorized representative of the Agency has reasonable cause to believe that there exists in any building or upon any premises any condition or Code violation which makes such building or premises an

eminent hazard, the representative of the Agency may enter such building or premises and take such action as is necessary to abate such hazard.

Whenever it is necessary to make inspections, investigations or surveys to enforce any of the provisions of this Code and permission is not obtainable, the Agency may request a court to issue a warrant to inspect or perform any duty imposed upon the Agency by this Code. Permission is not obtainable when:

1. The Agency's representative has presented to the occupant of an occupied building or premises proper credentials and been refused entry.
2. The Agency's representative has made a reasonable effort to locate the owner or other persons having charge or control of an unoccupied premises and has been unable to locate such person or has been refused entry by such person.

103.7 Orders. Whenever work is or has been performed contrary to the provisions of this Code, or whenever conditions exist which are in violation of this Code or any of the several codes or ordinances enforced or administered by this Agency, the Agency may:

1. Order any work stopped until authorized by the Agency to proceed. The owner, once notified of the order, shall not allow any further work upon the subject property until authorized by the Agency.
2. Order the work being performed or that has been performed to be completed or corrected so that the resulting work is in accordance with the requirements of this Code or other codes or ordinances enforced or administered by the Agency.
3. Order the use or occupancy of a building, structure or equipment discontinued and the structure, or portion thereof, vacated by notice served on any person causing such use to be continued. Such person shall discontinue the use within the time prescribed by the Building Official.

Any such order shall be by written notice served on the owner of the property upon which work was or is being performed or where the condition exists, or any person engaged in the work, causing the work to be performed or having a permit to perform the work.

It shall be unlawful to disobey any written lawful order issued by the Agency.

A copy of any order issued by the Agency shall, when the original order has not been served on the owner, be served upon the owner of the property affected by the order.

The Board of Appeals may review any appeal of an Agency order subject to Section 121.

SECTION 104
SERVICE

Service of any order may be by personal service, as specified in the Colorado Rules of Civil Procedure, or by certified mail, return receipt requested, and service shall be deemed complete upon delivery.

SECTION 105
APPLICATION TO EXISTING BUILDINGS

105.1 Additions, Alterations or Repairs. Additions, alterations or repairs may be made to any building or structure without requiring the existing building or structure to comply with all the requirements of this Code, provided that the addition, alteration or repair conforms to that required for a new building or structure, except as otherwise provided for in this Code. The Building Official shall use the 1997 edition of the Uniform Code for Building Conservation, and the 2006 International Existing Building Code, as guides for granting modifications to the Code for such additions, alterations or repairs.

105.2 When Additions, Alterations or Repairs are Not Allowed. Additions, alterations or repairs shall not be made to an existing building or structure which will cause the existing building or structure to be in violation of any of the provisions of this Code, unless otherwise provided for in this Code. Any addition, alteration or repair shall not cause an existing building or structure to become unsafe.

105.3 Materials. Non-structural alterations and repairs may be made with the same materials as the existing building or structure, provided they do not adversely effect any structural member, or the fire-resistive rating of any part of the building or structure.

Exception:

The installation or replacement of glass shall be as required for new installations.

105.4 Existing Occupancy.

1. Buildings in existence at the time of the adoption of the Code may have their existing use or occupancy continued, if such use or occupancy was legal at the time of the adoption of this Code, provided that such continued use is not dangerous to life.
2. Any change in the use or occupancy of any existing building or structure shall comply with the provisions of the Code.

105.5 Maintenance. All buildings, structures or utilities, both existing and new, and all parts thereof, shall be maintained in a safe and sanitary condition. All devices, utilities or safeguards which are required by this Code, or which were required under any previous Code or Ordinance, shall be maintained in good working condition. The owner or legally responsible person shall maintain such buildings, structures or utilities. To determine compliance with this subsection, the Agency may cause any building, structure or utility to be reinspected.

105.6 Moved and Temporary Buildings or Structures. Buildings or structures moved into the City shall comply with the provisions of this Code for new buildings or structures. Temporary structures, such as reviewing stands, and other miscellaneous structures, sheds, canopies or fences used in conjunction with special events or construction work may be erected by special permit from the Agency for a limited period of time as specified in Section 162. Temporary buildings or structures need not comply with the type of construction or fire-resistive requirements except where specifically required by this Code. Tents shall be permitted as specified in the Fire Code. Temporary buildings or structures shall be completely removed upon the expiration of the time limit stated on the permit.

105.7 Rehabilitation of Older Buildings. Chapter 61 of this Code may be applied to rehabilitation of older buildings.

SECTION 106
UNSAFE BUILDINGS OR STRUCTURES

106.1 General. Structures, buildings or equipment that are or hereafter become unsafe, insanitary or deficient because of inadequate means of egress facilities, or which constitute a fire hazard, or otherwise dangerous to human life or public welfare due to damage, vandalism, dilapidation or abandonment, or that involve illegal or improper occupancy, or inadequate maintenance or use inferior materials shall be deemed unsafe.

106.1.1 Additional Conditions. In addition, if any of the following conditions occur, the building or structure shall be deemed unsafe.

1. Those buildings or structures in which a wall or other vertical structural member lists, leans or buckles to such an extent that a plumb line passing through the center of gravity falls outside of the middle third of the base.
2. Those buildings or structures that show damage or deterioration to:
   A. Any structural or load-bearing member to the extent that the member does not have sufficient strength to resist all applicable loads specified in Chapter 16.
   B. Nonbearing exterior walls or enclosures to such an extent that they will not resist the wind pressure or lateral forces specified in Chapter 16.
   C. Any exposed exterior member to the extent that the member provides inadequate protection from the elements to the occupants of the building or structure.
3. Those buildings or structures in which the loads upon the walls, floors, roofs or any other necessary structural member exceed the maximum design limits specified in Chapter 16.
4. Those buildings or structures having floors or areas with inadequate means of egress.

5. Those building or structures having parts attached in such a manner that they may fall and cause injury to the public or property.
6. Uncompleted buildings or structures when the permit has been canceled.
7. Open pits, open wells and open excavations of all types when such are determined to be hazardous by the Agency.
8. Trenches or ditches not properly shored or cribbed.
9. Vacant buildings which are not secure and to which entry may be made through opened or unlocked doors, windows or other openings.
10. Those buildings or structures which are uninhabitable, including but not limited to buildings or structures, with any one of the following conditions:
    A. Where building envelope damage or deterioration has caused the interior of the structure to be open to the elements.
    B. Where vandalism or deterioration has caused the plumbing system, electrical system or heating system to be no longer functional.
    C. Where vandalism or deterioration has caused the internal floor structure or stairways to be incapable of supporting the weight of normal occupancy.
11. Any dilapidated building of whatever kind which is unused by the owner, or uninhabited because of deterioration or decay, which condition constitutes a fire hazard or subjects adjoining property to danger of damage by deterioration of structural building elements, storm effect, soil erosion or rodent infestation, or which becomes a place frequented by trespassers and transients seeking a temporary hideout or shelter.

SECTION 107
UNSAFE UTILITY

107.1 General. An unsafe utility is one which constitutes a fire hazard or a hazard to life, health, property or public welfare by reason of use, construction, installation, obsolescence, damage, deterioration, quality of materials, abandonment or inadequate maintenance. However, without limitation of the foregoing, any utility in which any one or more of the following conditions exist shall constitute an unsafe utility:

107.2 Gas-Fired, Oil-Fired, Solid Fuel-Fired Devices. Gas-fired, oil-fired or solid-fuel-fired appliances, devices or apparatus, which have any of the following, defects:

1. Broken or cracked heat exchangers.
2. Defective or deteriorated vents, venting or flues which permit leakage of flue products.
3. Defective or improperly installed fuel supply piping.
4. Insufficient air supply for the combustion of fuel.
5. Inadequate ventilation of the heating equipment room.
6. Defective, improperly installed or maladjusted controls and appurtenances.
7. Defective or improperly installed heating equipment.
8. Equipment locations which constitute a fire or explosion hazard.
9. When a negative air pressure condition exists in a heating equipment room or area.
10. Excessive corrosion of combustion chambers where the original thickness of the metal is reduced 50% or more.
11. Warped or distorted combustion chambers or furnace boiler firing doors which permit leakage of combustion products.
12. A listed appliance or appurtenance that is altered or modified.
13 . Excessive scaling, corrosion, cracks in seams, tube or shell of boilers.

14. Defective valves, gauges or cocks of boilers.
15. Grooving or pitting of boilers.
16. Boilers with improperly installed or maladjusted controls and appurtenances.
17. Any unlisted appliance or appurtenance installed without approval of the Agency.
18. Appliances not provided with required safety controls.

107.3 Elevators and Similar Conveyances. Elevators, escalators, dumbwaiters, moving walks or similar conveyances or apparatus which have any of the following defects:

1. Hoisting, counterweight or governor ropes or cables with frayed or broken strands.
2. Operation in a hoistway used to store material other than elevator equipment. This shall also apply to elevator machine rooms, machinery spaces and pits where materials other than elevator equipment are maintained or stored.
3. Operation in a hoistway that is in danger as a result of dust or other highly combustible material on the mechanism or in the hoistway, penthouse or pit.
4. Brake mechanism not functioning properly or safely.
5. Those not safety tested in accordance with the requirements of this Code, or where required safety devices have been disconnected or discontinued.
6. Those safety or operational devices provided in the elevator cab which are not functioning properly or safely.
7. Where hoistway entrance protection does not meet the requirements of this Code.

107.4 Electrical Systems. Electrical systems, appliances, devices or apparatus which have any of the following defects:

1. Bare wiring.
2. Poor electrical connections.
3. Overloaded circuits, feeders or services.
4. Equipment not properly grounded.
5. Disconnecting means not provided at the appliance.
6. Over-fused circuits.
7. Misuse of cord wiring.
8. Wiring not properly supported.
9. Nonapproved wiring exposed to extreme heat, moisture, gases or other harmful vapors or liquids.

107.5 Refrigeration Systems. Refrigeration systems which have any of the following defects:

1. Inadequate ventilation.
2. Inadequate venting of pressure relief valves.
3. Unauthorized fuel-fired equipment located in the same room designated for the refrigeration equipment.
4. Improperly installed cooling towers by reason of location, type, fan, water condition, controls, roof or floor overload.
5. Faulty controls.

107.6 Plumbing Systems. Plumbing systems or devices which have any of the following defects:

1. Supply water not meeting the standards of potability as required by the Colorado State Department of Public Health.
2. Water systems subjected to the hazards of backflow or back-siphonage, which might create pollution to the potable water supply; i.e., hose bibbs shall have anti-siphon devices.
3. Inadequate piping not supplying sufficient water to the various appliances.

4. Clogged sewers or drains.
5. Inadequate or missing trap seals.
6. Inadequate venting.
7. Leaking water, sewage or sewer gas within a building or structure.
8. Trenches or ditches not properly shored or cribbed.

SECTION 108
NOTICE AND ABATEMENT OF UNSAFE BUILDINGS, STRUCTURES OR UTILITIES

108.1 General. If, after inspection by the Agency, the building, structure or utility is determined to be unsafe, it shall be abated by repair, replacement, removal or demolition upon notice by the Agency. If the building or structure has common property line walls, then the Agency shall notify the adjacent building owners that their building may be unsafe and may require repair or reinforcement.

108.2 Unsafe Building or Structure. In the case of an unsafe building or structure, the Agency may order such building or structure, or any buildings or structures placed in jeopardy by the unsafe building or structure, vacated immediately. The unsafe buildings or structures shall be posted in accordance with the provisions of Section 108.7.

108.3 Unsafe Utility.

1. In the case of an unsafe utility, the Agency shall affix an approved warning tag on the unit declared to be unsafe. The Agency shall order the unsafe utility disconnected or its use discontinued until the nuisance created thereby is abated. In addition, the Agency may order any building, structure or utility which is placed in jeopardy by the unsafe utility to be vacated and/or disconnected, and these shall not be reoccupied or reconnected until declared safe by the Agency.
2. It shall be unlawful for anyone to mark any unsafe utility, as herein defined, with any type markings or tags declaring them to be unsafe, except as authorized by the Agency.

108.4 Demolition or Securing by the City. If the owner and/or occupant of an unsafe building, structure or utility fails to perform the repairs, rehabilitation, securing or removal required by an order within the time specified in the order or any extension of time to comply with said order, the City may, as set forth in Section 108.5, cause the demolition or securing of the unsafe building or structure.

108.5 Emergency Demolition or Securing. In the event an emergency should occur wherein the continued use or existence of a building, structure or utility may constitute an immediate hazard to life, health, property or public welfare, the Agency may order and/or cause the building, structure or utility to be demolished, removed, disconnected, secured or barricaded at once by any means available to the Agency. When feasible, the Agency shall attempt to give notice, by any means, to the owner of the building, structure or utility prior to taking any action. Cost and expense of demolition, removal, securing or barricading, if borne by the City, shall be recovered as provided for in Section 108.

108.6 Emergency Barricades. If any building, structure or utility is declared a hazard to life or safety of persons using a public way, the public way shall be provided with barricades to prevent public use. The barricades shall be erected on order from the Agency. Recovery of cost and expense, if borne by the City, shall be made as provided for in Section 108.9.

108.7 Posting of Signs. When necessary to protect life, property, health and public welfare, the Agency may post signs which shall prohibit entry into an unsafe building or structure. However, with permission of the Agency, it shall be lawful to enter the unsafe building or structure for the purpose of effecting any required repairs, rehabilitation or demolition; or by members of the Fire Department. The signs shall be provided and attached to the building or structure by the Agency and shall read, in addition to other information, "UNSAFE DO NOT ENTER". See Section 111 for Prohibitions and Violations.

108.8 Procedure for Demolition or Securing by City. Upon the failure of the owner or legally responsible person of a building or structure to make any building or structure safe after the issuance of an order, the Agency:

1. May obtain competitive bids for the securing or demolition of the building or structure.

2. May, upon receipt of bids, issue a notice of intent to raze or secure the building or structure which shall include the estimated cost of demolition or securing plus a fee not to exceed 25% of the cost of demolition or securing, with a minimum of $100 to cover administrative and other costs. Such notice shall be served personally or by registered or certified mail, return receipt requested, upon the owners of all recorded interests in the property at least 10 days prior to the demolition or securing.
3. If service cannot be obtained upon any or all parties with record interests as provided in subsection 2 above, may post the notice upon the property for 10 days and mail notices to the last known address of each party having a record interest.
4. Ten days after completion of service under subsection 2 or 3 above may proceed with demolition or securing.
5. Upon completion of the demolition or securing, shall mail a notice of the final cost of demolition or securing and of the intent to file a lien against the property to owners of a recorded interest in the property.

108.9 City's Lien. In the event the owner fails to pay the costs as set forth in the notice sent under Section 108.8.5 within 15 days of such notice, the amount shall constitute a lien against the real property upon which the building or structure was or is situated. The Agency shall thereafter pay the cost and expense of demolition, removal, securing and/or barricading, from any appropriation made available for that purpose, and shall certify a statement thereof to the Manager of Revenue, who shall assess and charge the same against the property involved and collect the same due, together with interest at the rate established by the law for delinquent real property taxes

1. The lien created thereby shall be superior and prior to other liens, regardless of date, except liens for general and specific taxes.
2. For purposes of this Code, cost and expense shall include the demolition, removal, securing, barricading and administrative costs incurred therewith.

108.10 Right to Appeal. The Board of Appeals may review an Agency decision under Section 108 upon appeal pursuant to Section 113.

SECTION 109
USED MATERIALS

Used materials may be used in the construction of any building, structure or utility only with prior approval of the Agency.

SECTION 110
ALTERNATE MATERIALS, DESIGN AND METHODS OF CONSTRUCTION AND EQUIPMENT

110.1 General. The provisions of this Code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternate has been approved. An alternate material, design or method of construction shall be approved where the Building Official finds that the proposed design is satisfactory and is for the purpose intended, at least the equivalent of that prescribed in this Code.

110.2 Application and Fee. An application for approval of an alternate material, design and/or method of construction or equipment shall be filed with the Agency. Information shall be that required by the Agency and this Code. Applications for alternate materials shall be accompanied by a fee of $200.00, payable to the Manager of Revenue, City and County of Denver, and shall be paid in the office of the Agency. No fee shall be required for alternate design and/or method of construction or equipment processed in conjunction with plan review fees applicable in accordance with Table No. 152.1 "Fee Schedule Building Permit Fees".

110.3 Review and Renewal. Each approved material, method or equipment shall be subject to a review and renewal of the approval every 3 years. The fee for each review shall be $75.00 per hour.

110.4 Agency Decision. The Agency shall notify the applicant in writing of its decision about the application for any such alternate methods, materials or equipment. No application shall be approved unless the Agency finds that the proposed design is satisfactory and that the alternate is, for the purpose intended, at least the equivalent of that prescribed in this Code.

110.5 Requirements and Tests.

1. When a construction material, assembly, fixture, device, utility or other article different from that provided for in this Code is proposed for use, the plans, specifications, details, test data, samples and literature shall be furnished to the Agency for review from approved sources.
2. Whenever there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials or methods, the Building Official shall have the authority to require tests as evidence of compliance to be made at no expense to the jurisdiction. Test methods shall be as specified in this code or by other recognized standards. In the absence of recognized and accepted test methods, the Building Official shall approve the testing procedures. Tests shall be performed by an approved agency. Reports of such tests shall be retained by the Building Official for the period required for retention of public records.

110.6 Approved Testing Laboratories. At the discretion of the Agency, new methods and materials may be acceptable if tested by a recognized testing laboratory or agency. The testing laboratory or agency must be one approved by the Agency and it shall provide listing, labeling and follow-up inspection services. A copy of the Agency approval report or the test report shall be submitted to the Agency for approval.

110.7 Right to Appeal. The Board of Appeals may review an Agency decision upon appeal, subject to Section 113.

SECTION 111
PROHIBITIONS, VIOLATIONS, PENALTIES AND REMEDIES

111.1 Prohibitions. It shall be unlawful for anyone to do or cause to be done any act or allow a condition to exist that violates or is contrary to the provisions of the Code, any other code, ordinance or rule and regulation promulgated thereunder which is enforced and administered by the Agency, and without limitation to the foregoing:

1. **Alternate Methods, Materials or Equipment.** It shall be unlawful for anyone to use any method, material or equipment as an alternate to the methods, materials or equipment permitted by this Code without first obtaining approval in the manner herein provided.
2. **Licensing, Certificate and Registration.** It shall be unlawful for any person to perform any work on any building or utility without first obtaining a license, certificate or registration in accordance with the requirements of this Code, except that the owner of a building, where authorized under Section 150 of this Code, who obtains a permit for the work being performed, need not be licensed, certified or registered.
3. **Licensing, Certificate and Registration Holder Responsibility.** It shall be unlawful for any license, certificate or registration holder to violate any of the responsibilities enumerated in Chapter 1 of this Code.
4. **Permits.** It shall be unlawful for any person to perform or cause to perform any work on any building, structure or utility without first obtaining a permit for such work from the Agency in accordance with Sections 150 through 165 of this Code.
5. **Certificate of Occupancy.** It shall be unlawful for anyone to occupy a new building or structure or change the occupancy of any building or structure without first having obtained a Certificate of Occupancy from the Agency as required by the provisions of this Code. A Certificate of Occupancy will not be required for remodeling or additions, unless there is a change of occupancy.
6. **Unsafe Building, Structure or Utility.** It shall be unlawful for any person to maintain or permit to be maintained any building, structure or utility which is unsafe as defined in this Code. These provisions shall apply to buildings, structures or utilities that are new, existing, under construction, altered or demolished.
7. **Enter, Occupy or Inhabit an Unsafe Building or Structure.** It shall be unlawful to enter, occupy or inhabit any unsafe building or structure posted in accordance with the provisions of Section 108.7.
8. **Removal of Danger Sign(s).** It shall be unlawful to remove or deface a sign required by Section 108.7, without specific approval from the Agency.
9. **False Information.** It shall be unlawful to furnish the Agency any false information in any application for a license, certificate or permit required by this Code or during the course of an investigation conducted by the Agency to enforce this Code.

10. **Operate or Maintain Unsafe Utility.** It shall be unlawful for any person to operate or maintain an unsafe utility or reconnect the power or fuel supply to any utility declared by the Agency as being unsafe, and to which a City red tag has been attached as provided for in Section 108.3.1 of this Code. The owner and occupant of any building or structure containing an unsafe utility to which a City red tag has been attached, who has notice that the utility has been declared unsafe and so tagged by the Agency, shall not permit said utility to be operated and shall take whatever steps are necessary to insure that the utility is not operated.

    Exception:

    A properly Licensed Contractor with a permit may remove a City red tag for purposes of repair of the equipment. However, in the case of elevators, it shall be unlawful to allow any person to occupy the elevator except a licensed contractor and his employees during said repairs. Permission shall be obtained from the Agency prior to removal of the City red tag.

11. **Removal of City Warning or City Danger Tag.** It shall be unlawful for any person to remove a City red tag attached to any utility as provided for in Section 108.3.1 of the Code.

12. **Conspiracy.** It shall be illegal for any person to act with another for the purpose of evading requirements of this Building Code.

111.2 Violation. Whenever, by the provisions of this Code, any act is prohibited, or whenever any regulation, dimension or limitation is imposed on the erection, alteration, maintenance or occupancy of any building, structure or utility, each failure to comply with provisions of this Code shall constitute a violation. Each day on which a violation exists shall constitute a separate offense and a separate violation.

111.3 Penalties. Whenever, in any Section of this Code, or any Section of a Rule or Regulation promulgated thereunder, the performance of any act is required, prohibited or declared to be unlawful, and no definite fine or penalty is provided for a violation thereof, any person convicted of a violation of any Section shall, for each offense, be fined, imprisoned or both fined and imprisoned within the limits established by Section 1-13 of the Denver Revised Municipal Code. The suspension or revocation of any license, certificate, permit or other privileges conferred by the City shall not be regarded as a penalty for the purpose of this Code.

111.4 Remedies. In the event any building, structure or utility is erected, constructed, reconstructed, altered, repaired, converted, demolished, moved, maintained or used in violation of this Code, the City or any proper person may institute an appropriate action or proceedings to prevent the unlawful erection, construction, reconstruction, alteration, repair, conversion, maintenance or occupancy, and to restrain, correct or abate such violation, or to prevent the occupancy of said building, structure or land. The imposition of any penalty thereunder shall not preclude the City or any proper person from instituting any appropriate action or proceeding to require compliance with the provisions of this Code, and with administrative orders and determination made thereunder.

SECTION 112
BOARD OF APPEALS

112.1 Creation. There is hereby created a Board of Appeals (the "Board"), which shall consist of 5 members and 3 alternates appointed by the Mayor. The Board shall be comprised of the following persons:

1. One professional engineer registered in the state of Colorado.
2. One architect licensed in the state of Colorado.
3. One person who is the holder of a City Building Contractor Class A, B or C license.
4. Two citizen members who are not associated with the building industry.

Two alternates shall be a professional engineer registered in Colorado and an architect licensed in Colorado, respectively. A third alternate shall be a citizen not associated with the building industry. Alternates may appear at all meetings and shall be allowed to vote even if not filling a temporary vacancy.

112.2 Secretary. There shall be a Secretary of the Board, furnished by the Agency. The Secretary shall be the custodian of the records, shall conduct official correspondence of the Board and generally be responsible for clerical work of the Board. The Secretary shall be present at all meetings and shall present all relevant information regarding appeals to the

Board, including the application and other information submitted by the Applicant prior to the hearing. The Secretary shall notify all interested parties regarding matters of the Board.

112.3 Fire Department Representative. The Chief of the Fire Prevention and Investigation Division, or his authorized representative, shall be an ex-officio member to the Board without voting power. Terms of office and remuneration shall not be applicable to this member.

112.4 Terms. As of the effective date of this Ordinance, the members of the Board of Appeals as constituted under the Amendments to the Building Code for the City and County of Denver, as adopted by Ordnance number 263, Series of 1999 shall continue to serve for the unexpired portion of their terms. The Mayor shall appoint Board members and alternates as necessary to fill expiring terms and such terms shall be for 3 calendar years. No member of the Board shall serve more than 3 consecutive full terms or a total of more than 9 consecutive calendar years. Any vacancy that occurs in the Board shall be filled by the Mayor for the unexpired term of that Board member. Board members may be removed only for cause upon written charges.

112.5 Procedures – Meetings – Quorum.

1. **Regular Meetings.** Regular meetings shall be held once each month, or as often as may be required by the Agency. At the first regular meeting of each calendar year, the Board shall elect a Chairman and a Vice-Chairman. The Chairman of the Board shall require that all members of the Board be polled during voting at the meeting. Three members of the Board shall constitute a quorum.
2. **Special Meetings.** Special meetings may be held at the call of the Chairman and at such times as the Board shall determine. The Board, the Agency or an appellant may request a special meeting. Any special meeting held at the request of an appellant shall be paid for by the appellant in the amount of $150.00. Three members of the Board shall constitute a quorum at special meetings.
3. **Business Meetings.** Business meetings of the Board may be called by the Chairman of the Board.
4. **Public Notice.** Public notice shall be given of all meetings and all meetings shall be open to the public except executive sessions or business meetings.
5. **Notice.** Due notice of all meetings shall be given by the Secretary to all parties in interest, including the Agency. The Agency shall be permitted to intervene, for and on behalf of the City, in all public meetings.
6. **Oath/Subpoena.** The Chairman may administer oaths, accept affirmations and compel the attendance of witnesses. A failure or refusal to appear in response to a subpoena issued by the Board shall constitute a violation of this Code.
7. **Agency/Interested Party.** At any public meeting a representative of the Agency and Fire Department and any other interested party may appear in person, by agent or by attorney, offer evidence and testimony and cross-examine witnesses. All evidence and testimony shall be presented publicly. The Board may take judicial notice of facts to the same extent and in the same manner as courts of record and may consider relevant facts within the personal knowledge of any member of the Board that are stated into the record by such member.
8. **Recording.** All meetings before the Board shall be recorded either by electronic means or by a Certified Court Reporter.

112.6 Powers and Duties of the Board.

1. **Rules and Procedures.** The Board shall adopt rules and procedures governing all proceedings before it consistent with the provisions set forth herein. The rules and regulations shall include proper procedures and time periods for applying to the Board, contents of the application and time allotted for each case.
2. **Powers.** Subject to the limitations enumerated herein, the Board shall have and may exercise the following powers:
   - **A. Administrative Review.** To hear and decide appeals where it is alleged there is error in any order, requirement, decision or determination made by the Agency in the enforcement of this Code.
   - **B. Variances.** To hear, grant or deny requests for a variance from the terms of the Code or from an order or decision of the Agency upon finding that the following conditions exist:
     - i. That the applicant properly applied for a variance under Section 113.

ii. That, owing to Exceptional and extraordinary circumstances, there are practical difficulties or unnecessary hardship involved in carrying out the strict letter of the Code.

iii. That the variance will not weaken the general purposes of the Code.

iv. That the variance will be in harmony with the spirit and purposes of the Code.

v. That the variance will not adversely affect the public health and safety.

vi. That the variance will not adversely affect the structural integrity of the building.

vii. That the variance will not adversely affect the fire safety of the building.

C. Alternate Methods and Materials. To hear and decide appeals from the Agency denial of an application for alternate materials and methods of construction and equipment under Section 110 herein, after the applicant has obtained an approval or certified test results from an approved testing agency. All relevant information and documentation shall be submitted to the Board prior to the hearing. The decision of the Agency shall not be overturned unless the Board shall find that the following conditions exist:

i. That the applicant properly applied under the terms of Section 110.

ii. That the proposed design is satisfactory and that the alternate is, for the purpose intended, the equivalent of that prescribed in this Code.

iii. That the proposed alternate will not weaken the general purposes of this Code.

iv. That the proposed alternate will be in harmony with the spirit and purposes of this Code.

v. That the proposed alternate will not adversely affect the public health and safety.

vi. That the proposed alternate will not adversely affect the structural integrity of the building.

vii. That the proposed alternate will not adversely affect the fire safety of the building.

viii. That a written request for an extension of a temporary certificate of occupancy was filed at least 30 days prior to the expiration of any temporary certification of occupancy when applicable.

D. Stay of Enforcement. The Board shall have the power to stay the enforcement of any order issued by the Agency unless the Building Official certifies that a stay of the order or denial would, in the opinion of the Building Official based on facts stated in the request for a variance, cause imminent peril to life or property. A stay shall not constitute a variance, shall be personal to the applicant and not transferable, and shall be subject to the terms and conditions imposed by the Board.

3. Additional Powers. The Board shall have and exercise the powers hereinafter set forth in connection with Chapter 10 of the Revised Municipal Code. In the exercise of its powers, the Board may reverse or affirm, wholly or partly, or may modify the order, requirement, decision or determination as ought to be made, and, to that end, shall have all the powers of the officer or department from whom the appeal is taken. Notwithstanding the above and any other part of this Section 112, the Board shall not have these powers with respect to Articles I, IV, V, and VIII of Chapter 10.

A. Administrative Review. To hear and decide appeals where it is alleged there is error in any order, requirement, decision or determination made by an administrative official in the enforcement of Chapter 10 of the Revised Municipal Code.

B. Variations. To authorize, upon appeal in specific cases, such variations from the terms of Chapter 10 of the Revised Municipal Code, subject to terms and conditions fixed by the Board, as will not be contrary to the public interest where, owing to Exceptional and extraordinary circumstances, literal enforcement of the provisions of Chapter 10 of the Revised Municipal Code would result in unnecessary hardship. Every variation authorized hereunder shall not be personal to the applicant therefore, but shall not be transferable and shall run with the land. No variation shall be authorized hereunder unless the Board shall find that all of the following conditions exist:

i. That the use proposed by the applicant is a permitted use in the zoning district applicable to the subject land.

ii. That literal enforcement of Chapter 10 of the Revised Municipal Code would preclude a reasonable development of the land of the applicant for the use proposed.

iii. That the development of the land proposed by the applicant would not be such as to defeat the purpose of Chapter 10 of the Revised Municipal Code.

iv. That the development proposed by the applicant is the minimum development which would be needed to secure for the applicant from the land a reasonable return in service, use or income.

v. That the development proposed by the applicant would not result in damage to neighboring properties or public lands.

4. **Decision of the Board.** In the exercise of the powers described above, the Board may reverse or affirm, wholly or in part, or may modify the order, requirements, decision or determination appealed from; may impose conditions or requirements as deemed necessary; and may make such order, decision or determination as ought to be made and has the right to hold cases in abeyance until proper information needed by the Board is supplied. Decisions shall be filed with the Agency as a matter of public record.

112.7 Procedure and Notice. Upon written receipt of a request for a variance, notice of the request shall be sent to the Fire Department, the City Attorney and the owner of the real estate affected by the request for a variance. No variance shall be granted until 15 days after the required notifications are mailed.

112.8 Limitations of Powers.

1. The Board shall issue a written decision, based on evidence presented at the public meeting, setting forth the necessary findings of fact and the final decision of the Board. A copy of this decision shall be mailed by the Secretary to all interested parties who received notice under subsection 112.7, including the Agency. The Board may order that a copy of the decision be recorded in the office of the Denver Clerk and Recorder.

2. The concurring vote of 3 members of the Board, or a majority of those present and voting, whichever is greater, shall be necessary to decide any matter upon which the Board is required to pass under this section of this Code.

3. The Board of Appeals shall have no authority to review administrative decisions or grant variances to the provisions of Chapters 1 of this Code except where specifically provided by the following Sections: Section 103.6 Orders; Section 108 Notice and Abatement of Unsafe Buildings, Structures or Utilities; Section 110 Alternate Materials and Methods of Construction and Equipment; Section 122.3 Application and Fee; Section 160 Certificate of Occupancy; and Section 162 Permits for Temporary Building.

4. Any determination or order of the Agency shall be presumed to be correct until evidence is introduced that would support a contrary determination.

5. **Findings of Fact.** Every decision of the Board shall be based upon findings of fact and every finding of fact shall be supported in the record of its proceedings. The enumerated conditions required to existing on any matter upon which the Board is authorized to pass under Chapter 10 of the Revised Municipal Code or to effect any variations in Chapter 10 of the Revised Municipal Code shall be construed as limitations on the power of the Board to act. A mere finding or recitation of the enumerated conditions unaccompanied by findings of specific facts shall not be deemed findings of fact and shall not be deemed compliance with Chapter 10 of the Revised Municipal Code.

6. **Powers Construed.** Nothing contained in this article shall be construed to empower the Board to change the terms of Chapter 10 of the Revised Municipal Code or to effect changes in any map incorporated therein. The powers of the Board shall be so construed that the intent of Chapter 10 of the Revised Municipal Code and the maps incorporated therein are enforced.

112.9 Compensation. Each member of the Board shall receive $70.00 per meeting attended regardless of number or type of cases heard.

SECTION 113
APPEALS

113.1 Method of Application Fee. Prior to action by the Board, an application shall be filed with the Agency on a form providing the necessary information required by the Board. An appeal shall not be considered unless filed with the Agency at least 15 days prior to the meeting. Upon filing the application, a fee of $70.00 shall be paid to the City. All

checks shall be made payable to the Manager of Revenue, and shall be paid in the office of the Agency. This fee is not refundable.

113.2 Grievance. Any person or city agency aggrieved by a decision of the Agency; any person or city agency claiming practical difficulties or unnecessary hardships in complying with the strict letter of the Code or Chapter 10 of the Revised Municipal Code; or where it is alleged there is error in any order, requirement, decision or determination made by the Agency, may, within 30 days of the date of notice of such decision or order, appeal the decision or order of the Agency by filing an application with the Board.

Exception:

Appeals of notices issued under Section 108.8, where such notice is personally served or delivered by overnight mail, shall be made within 10 days of the delivery of such notice or the refusal to accept such notice.

113.3 Unsafe Condition. Whenever the owner or legally responsible person of an alleged unsafe building, structure or utility or other condition does not agree with the order from the Agency as to the correction to be made, the owner shall have the right to appeal to the Board within 30 days from the date of said order. In the appeal, the owner shall state how the owner proposes to make the building, structure, utility or other condition safe and, if required by the Board, the owner shall submit detailed engineering analysis or recommendations, accompanied by plans and specifications prepared by a Colorado licensed Architect or Colorado registered Professional Engineer, as prescribed in this Building Code. The Board may require substantiating data concerning the removal or other remedial steps to be taken to render the building, structure, utility or other condition safe.

113.4 Hazard. In any matter in which an order or notice relating to an unsafe building or structure is appealed, the Agency may certify to the Board that the building or structure could become an imminent hazard, in which case the Board shall schedule a meeting within 3 work days to hear said appeal.

SECTION 114
APPEALS FROM DECISIONS OF THE BOARD

114.1 Procedure. Any person aggrieved by the City, or any officer, Agency or division of the City may have a decision of the Board reviewed in the manner provided by the Colorado Rules of Civil Procedure. The Board shall not be required to return the original papers acted upon by it, but shall return copies thereof. The returned copies shall concisely set forth other pertinent facts and material to the decision appealed from and shall be verified.

114.2 Effect of Appeal. The issuance of a writ on a petition hereunder shall not stay proceedings upon the decision appealed from; but the court, on application after notice to the Board and on due cause shown, may grant a restraining order.

114.3 Transcript Costs. Whenever a transcript is demanded by the person taking the appeal, or when a transcript is furnished by the Board pursuant to court order, the cost of preparing the transcript of proceedings shall be borne by the appellant, in the amount of at least $200.00.

SECTION 115
VALIDITY OF BUILDING CODE

If any Section, subsection, sentence, clause or phrase of the Code is, for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portions of the Code.

SECTION 116
LIABILITY

The Building Official, or authorized employee or representative charged with the enforcement of this Code, acting in good faith and without malice in the discharge of his duties, shall not thereby render themself personally liable for any damage that may accrue to persons or property as a result of any act or by reason of any act or omission in the discharge of his duties. Any suit brought against the Building Official or employee because of such act or omission performed by them in the enforcement of any provision of the Codes or the Charter, or other pertinent laws or ordinances implemented through

the enforcement of this Code or enforced by the Agency, shall be defended in accordance with Section 108 of Chapter 24, Article 10, C.R.S.

This Code shall not be construed to relieve from or lessen the responsibility of any person owning, operating or controlling any building or structure for any damages to persons or property caused by defects, nor shall the Agency or City be held as assuming any such liability by reason of the inspections authorized by this Code or any certificates of compliance or occupancy issued under this Code.

Sections 117 through 119 are reserved.

SECTION 120
LICENSING, CERTIFICATION, REGISTRATION

This Chapter provides for the licensing of all persons, the certification of supervisory personnel, registration and other types of certifications. For Fire Department license requirements for fire protection and fire alarm see the Administrative Section 112.2 of the International Fire Code Amendments (IFCA)

SECTION 121
AUTHORITY

121.1 Licenses. The Agency is vested with the authority to establish licensing procedures, to qualify applicants for licenses and to issue, revoke, renew and suspend licenses.

121.2 Certificates. The Agency is vested with the authority to establish certification procedures, prequalify applicants and issue, revoke, renew and suspend certificates.

SECTION 122
LICENSES OR REGISTRATION

122.1 Definitions.

1. A license is authority granted by the City to a person, agency or political entity to perform the work authorized by the license.
2. A registration is authority granted by the City to an electrical contractor registered by the State of Colorado to perform the work authorized by said registration.

122.2 Licenses or Registration Required. Licenses shall be required for all types of work described in this Chapter. Plumbing contractors shall be licensed by the Agency and shall have a master plumber license issued by the State of Colorado as the licensee or a full time employee of the contractor shall be registered as a master plumber. Electrical contractors registered by the State of Colorado shall also register with the Agency. Electrical registrants are required to comply with all the requirements of this Code.

Exceptions:

1. Public utility companies will not be required to obtain licenses when engaged in the installation, operation and maintenance of their equipment used for the production, generation or distribution of the utility, product or service through the facilities owned or operated by the utility company to the point of customer service.
2. Work performed by a home owner of a single family dwelling buildings, townhouses and U Occupancies when work is performed under a permit authorized by Section 151.2.3.
3. Upon prior approval by the Agency, a licensed Building Contractor Class A, B or C, and a homeowner, when constructing single family buildings may have unlicensed subcontractors working under the licensed contractor's or homeowner's building permit. This does not apply to Utility or Roofing Contractor.

122.3 Application. Every applicant for a license shall fill out a form provided by the Agency. The name of the certified supervisor shall appear on the license application. The applicant shall be notified of the action taken on the license application by the Agency. If the license is approved, the applicant shall procure this license within 90 days after notification. Failure of the applicant to procure the license shall require the filing of a new application with fee. If the

application for license is disapproved by the Agency, the applicant may appeal to the Board of Appeals in the manner provided for in this Building Code.

122.4 Certified Supervisor Required. Where required each licensee shall be required to have in his employ a supervisor who holds a Supervisor Certificate of Qualification for that particular license. A plumbing contractor, shall be required to have in his employ a holder of a State of Colorado Master Plumbers License as the required supervisor. The license shall be valid only as long as the named supervisor remains in the employ of the licensee in an active, full-time capacity. "Active, full-time capacity" shall mean that the supervisor shall be available at the local office of the company, at home or at the job site within a reasonable period of time. The supervisor shall take an active role in supervising and reviewing all work performed and materials used by the company in the process of construction. If the supervisor should leave the employ of the licensee, the licensee shall notify the Agency within 3 working days after the termination. Failure of the licensee to notify the Agency shall be cause for suspension or revocation of the license. The licensee shall be required to obtain a certified supervisor within 30 working days after the date the supervisor leaves the employ of the licensee. If a supervisor is not obtained within the 30-working-day period, the license shall be deemed suspended until the supervisor is obtained and the Agency notified.

1. **Individual.** If the licensee is an individual, the licencee also may qualify as the Supervisor for that license, after examination.
2. **Not Required.** Electrical registration shall not require a certified supervisor.

SECTION 123
CLASSIFICATION OF LICENSES AND REGISTRATION

123.1 General. There shall be various classes of licenses and an electrical registration and the holder thereof shall be authorized to perform the following:

1. **Building Contractor Class A** (General Contractor ICC Classification). To erect, add to, alter, demolish or repair any building or structure. All work shall be performed under the supervision of the holder of a Class A Construction Supervisor Certificate.
2. **Building Contractor Class B** (Building Contractor ICC Classification)**.** To erect, add to, alter or repair any building or structure of the following construction types:

   A. Types I or II limited in height to less than a high rise and in area to that allowed for a Type III building.

   B. Type III, IV or V buildings.

   The demolition of any one and two-dwelling unit buildings or one-story building or structure is permitted. The contractor may install nonbearing partitions, do interior finish work, or replace windows from the interior side in any type of building or structure. All work shall be performed under the supervision of the holder of Class A or B Construction Supervisor Certificate.
3. **Building Contractor Class C** (Residential Contractor ICC Classification)**.** To erect, add to, alter or repair one and two family dwellings U Occupancy buildings and attached single unit dwellings (townhouses). The demolition of any one and two-dwelling unit building or U Occupancy building or structure is permitted. All work shall be performed under the supervision of the holder of Class A, B or C Construction Supervisor Certificate.
4. **Building Specialty Contractor Class D.** To perform building construction work which is covered by the Code, but is not assigned to any other license listed in this section. All work shall be performed under the supervision of the holder of the particular Class D Supervisor's Certificate. Those building construction activities shall be approved separately and shall include but not be limited to the following:

   Antennas. Antennas attached to buildings or freestanding. This includes antenna towers. Not allowed to alter any structural members of a building.

   Building insulation.

   Concrete and foundations. Combined excavating, shoring, piles, caissons and drilled shafts and cast-in-place concrete.

Concrete reinforcing steel placers. Placement of reinforcing bars, pre- or post-tensioning steel, bar supports and welded wire fabric for reinforced concrete construction.

Curtain walls. Installation of curtain walls and storefronts.

Custom size replacement windows. Work limited to townhouses, one and two family dwelling unit buildings not requiring any structural alterations.

Fence structures.

Fire doors.

Fireproofing. Application of fireproofing materials.

Inside tap and backflow preventor.

Lathing, plastering and dry wall. Installation of all lathing, plastering and dry wall including the installation of nonbearing partitions, stucco or exterior texturing of buildings or structures and suspended ceiling systems.

Masonry. Laying and forming all types of masonry.

Material handling equipment.

Non-Structural Residential Remodel. The specifications for this type are two years of field experience in framing, drywall, and finish work. This is for single-family, duplex or town home properties for residential basement finish, and kitchen and bath remodels only. This is for Non-Bearing and Non-Structural work only.

Open deck. Including supporting foundation and attachment to buildings. Does not allow construction of shade devices or roof structures. Work to be done only on one and two family dwellings.

Outdoor stage erection: Erection of outdoor stages, mobile stages, platforms or reviewing stands.

Overhead doors.

Pneumatic tubes.

Power-operated door installers.

Pre-cast concrete building units. The erection of precast concrete structural units.

Prefabricated patios, carports, canopies and awnings.

Racks for high piled storage.

Raised access floor.

Retaining walls.

Roof covering and waterproofing. Installation of commercial and residential roof coverings, including valleys, gutters, downspouts and waterproofing.

Scaffold erection.

Security bars, grills and grates.

Siding.

Sign Erection (Non-Electrical). The specifications for this type are Two years of field experience in installing wall and ground signs not exceeding 200 square feet or exceeding 10 feet in height.

Structural metals. The fabrication and erection of structural metal members for all buildings or structures.

Swimming pools. Installation of swimming pools required by this Code.

Temporary prefabricated mobile buildings. Setting up temporary buildings.

Tenant finish (Commercial). Interior nonbearing and nonstructural work only. Four (4) years of field experience as a supervisor or general contractor in commercial tenant finish work.

Tile, marble, sandstone, granite, terrazzo, chemical broadcast and troweled floor finish systems. Install and remove from existing construction.

Trash chute. Factory assembled with all joints welded and installed in accordance with manufacturer's installation instructions and approved by Agency.

Wheelchair and Stair Lift. Installation of wheelchair lift, maximum lift of 4 feet, and stair lift installation in 1 (one) and 2 (two) family dwellings include townhomes. A separate electrical permit will be required in addition to the 1R construciton permit for instllation.

Wood Framing. The fabrication and erection of wood framing for all types of buildings.

5. **Access Control System Contractor.** Access Control System Contractor to install, add to, alter or repair control units, electric door hardware, wiring and raceways electrically interconnected to control and regulate ingress and egress. Voltages shall not exceed 48 volts or the system shall be power limited as defined by the National Electric Code. Complete conduit or raceway systems shall not be installed by the holder of this license. All work shall be performed under the supervision of the holder of an Access Control Supervisor's Certificate. A certified supervisor shall be present at all work sites at all times that work is being performed.

6. **Boilermaker Contractor.** To install, assemble or repair steam and hot water boilers, all pressure and nonpressure vessels, precipitators, breeching, metal stacks, plates and casings. All work shall be performed under the supervision of the holder of a Boilermaker Supervisor Certificate.

7. **Demolition Contractor Class A.** To demolish any building, structure, utility or portion thereof. All work shall be performed under the supervision of the holder of a Class A Demolition Supervisor Certificate.

8. **Demolition Contractor Class B.** To demolish any building not more than 30 feet in height. All work shall be performed under the supervision of the holder of a Class A or B Demolition Supervisor Certificate.

9. **Electrical Registration.** Performs all work authorized by the Registration issued by the State of Colorado.

10. **Electrical Signal Contractor.** To install, add to, alter or repair electrical wiring and equipment for fire alarm, fire detection, emergency voice communication systems, electrical signaling and control wiring. Voltages shall not exceed 48 volts or the system shall be power limited as defined by the National Electrical Code. The holder of this license shall not install complete conduit or raceway systems. All work shall be performed under the supervision of the holder of an Electrical Signal Supervisor Certificate.

11. **Elevator Contractor.** To install, add to, alter or repair elevators, escalators, moving sidewalks, moving ramps, dumbwaiters, stage lifts, manlifts and amusement devices which employ ropes, cables, pulleys or platforms. In addition, this license shall include electrical work from the elevator controls to elevator equipment. This work does not include termination to any fire alarm system. All work shall be performed under the supervision of the holder of an Elevator Supervisor Certificate.

12. **]F]Fire Protection Contractor Class A.** To install, add to, alter or repair fire-extinguishing systems of all types. All work shall be performed under the supervision of the holder of a Class A Fire Protection Supervisor Certificate.

13. **[F]Fire Protection Contractor Class B.** To install, add to, alter or repair automatic fire sprinkler and standpipe systems of all types. All work shall be performed under the supervision of the holder of a Class A or Fire Protection Supervisor Certificate.

14. **[F]Fire Protection Contractor Class C.** To install, add to, alter or repair approved nonwater, factory engineered extinguishing systems. All work shall be performed under the supervision of the holder of a Class A or C Fire Protection Supervisor Certificate.

15. **Gas Service Contractor.** To install, add to, alter or repair the following equipment, which utilizes gas or liquid fuel:

    A. Gas and liquid fuel piping.

    B. Gas and liquid fuel controls.

    C. Commercial cooking equipment.

    D. After burners.

    E. Ranges.

    F. Dryers.

G. Conversion burners.

H. Venting of domestic water heaters, dryers and incinerators.

I. Water heaters not exceeding 100 MBtu input.

J. Low voltage wiring which does not exceed 48 volts and is not enclosed in a conduit or raceway.

All work shall be performed under the supervision of the holder of a Gas Service Supervisor Certificate or a Heating and Ventilating Class A Supervisor Certificate

16. **Heating and Ventilating Contractor Class A.** To install, add to, alter or repair warm air heating, venting, ventilation, evaporative cooling, exhaust systems and their appurtenances, ductwork, dust collection systems, domestic and commercial range hoods, water heaters not exceeding 100 Mbtu input, gas piping; burners, controls and venting, trash and laundry chutes; exterior sheet metal, duct insulation, low voltage wiring which does not exceed 48 volts and is not enclosed in a conduit or raceway and maximum of 10 tons of refrigeration when it is utilized for comfort cooling and the refrigerating system is self-contained. This refrigeration shall not include systems with precharged lines or separate air-cooled condenser or chilled water systems. All work shall be performed under the supervision of the holder of a Class A Heating and Ventilating Supervisor Certificate.

17. **Heating and Ventilating Contractor Class B.** To install, add to, alter or repair, in one or two-family dwellings, townhomes or U Occupancies only, warm air heating systems and their appurtenances, ductwork, ventilation, evaporative cooling, duct insulation, exterior sheet metal, gas piping; burners, venting and controls, water heaters not exceeding 100 Mbtu input and low voltage wiring which does not exceed 48 volts and is not enclosed in a conduit or raceway. All work shall be performed under the supervision of the holder of a Class A or B Heating and Ventilating Supervisor Certificate.

18. **Hot Water Contractor.** To install, add to, alter or repair, in one or two-family dwellings, townhomes or Group U Occupancy only, hot water heating systems and their appurtenances, solar water heating, water heaters, gas piping and controls, pipe insulation and low voltage wiring which does not exceed 48 volts and is not enclosed in a conduit or raceway. All work shall be performed under the supervision of the holder of a Steam and Hot Water or Hot Water Supervisor Certificate.

19. **Moving Contractor.** Moving of all types of buildings or structures. All work shall be performed under the supervision of the holder of a Moving Supervisor Certificate.

20. **Plumbing Contractor Class A.** To install, add to, alter or repair sanitary plumbing, potable water supply piping and appliances connected thereto, storm sewer, gas piping, water heaters, gas ranges, domestic gas incinerators, swimming pool and spa piping, solar plumbing utilized for potable water, and all medical gas and vacuum systems in health care facilities. All work shall be performed under the supervision of the holder of a State of Colorado Master Plumbers License.

21. **Refrigeration Contractor Class A.** To install, add to, alter or repair refrigeration systems and appurtenant cooling towers, pipe insulation and low voltage wiring which does not exceed 48 volts and is not enclosed in a conduit or raceway. A permit or license is not required for the installation of self-contained window type air conditioners. All work shall be performed under the supervision of a Class A Refrigeration Supervisor Certificate.

22. **Refrigeration Contractor Class B.** To install, add to, alter or repair, in Group one and two family dwellings, townhouses and Group U Occupancies, refrigeration systems consisting of self-contained refrigeration systems of 5 tons or less, the installation of precharged systems utilizing Group 1 Refrigerants and gas-fired absorption chillers. All work shall be performed under the supervision of the holder of a Class A or B Refrigeration Supervisor Certificate.

23. **Sign Contractor.** To, install, erect or maintain all types of signs unless exempt by Section 150. All work shall be performed under the supervision of the holder of a Sign Supervisor Certificate.

24. **Steam and Hot Water Contractor.** To install, add to, alter or repair steam and hot water heating systems, solar water heating; process piping and related appurtenances; piping used for the transmission of chemicals, gases, air and other products; all items regulated by the Mechanical and Plumbing Code for boilers, pressure vessels, steam and water heating systems and process piping; low-static gas-fired unit heaters; industrial ovens; burners; controls; piping and controls utilizing gas, liquid or solid fuel; water heaters; pipe insulation and low-voltage

wiring which does not exceed 48 volts and is not enclosed in a conduit or raceway. All work shall be performed under the supervision of the holder of a Steam and Hot Water Supervisor Certificate.

25. **Water Service Contractor.** To install or repair service lines and appurtenances from the corporation cock on the main up to and including:

    A. The first valve downstream of the meter, for an inside meter setting; or

    B. The first valve inside the structure, for an outside meter setting.

    This license shall not permit the installation of the water meter. All work shall be performed by or under the supervision of the holder of a Water Service Supervisor Certificate or a State of Colorado Master Plumbers License.

SECTION 124
LICENSE FEES

124.1 Annual Fees Required. An annual license fee of $80.00 shall be paid to the Agency.

124.2 License Fee Refund. License fees shall not be refundable.

SECTION 125
LICENSE RENEWAL

All licenses are subject to annual renewal.

SECTION 126
REISSUANCE OF LICENSE

The Agency shall have the authority to reissue a license without the filing of a new application, provided that the reissuance is accomplished within one year after the license has expired.

SECTION 127
LICENSEE AND REGISTRANT RESPONSIBILITY

127.1 Licensee Responsibility. Licensees shall be responsible for performing all work in conformity with the provisions of the Code, including, but not limited to, the following items:

1. To report in writing to the Agency, within 3 working days, any accident occurring on any construction which results in injury or damage to the building, structure or utility, and any accident occurring during demolition.
2. To provide minimum safety measures and equipment to protect workmen and the public.
3. To present the license card when requested by the Agency.
4. To employ a full-time qualified supervisor certified in accordance with the requirements of this Code.
5. To employ qualified journeymen certified in accordance with the requirements of this Code.
6. To obtain a permit when required prior to commencing work.
7. To faithfully construct, without departure from drawings and specifications filed and approved by the Agency and permit issued for same, unless changes are approved by the Agency.
8. To complete all work authorized by the permit issued under the authority of this Code, unless acceptable cause is indicated to the Agency.
9. To obtain inspection services where required by this Code.
10. To pay any fee assessed under authority of this Code.
11. To obey all orders or notices issued under the authority of this Code.

12. To provide all vehicles used in the operation of the business with the identification in letters a minimum of 2 inches in height and a color contrasting to the background. The identification shall include the following information:

    A. Name of company.

    B. Business address.

    C. Business telephone.

13. To provide toilet facilities prior to and during construction or demolition.

14. To maintain with the Agency a current mailing address. Any Order, Notice, Summons and Complaint or other Agency communication, whether delivered by personal service or by certified, registered or first class mail sent to that address, shall constitute service.

127.2 Registrant Responsibility. Registered electrical contractors shall comply with all provisions of Section 127.1 above and in addition shall comply with all provisions of the Colorado State Electrical Board.

127.3 Demolition and moving liability insurance. Any person, firm or corporation demolishing or moving any building, structure or utility shall provide insurance to cover bodily injury and property damage to the public or public property. A copy of the certificate of liability insurance shall be provided to the Agency. This insurance shall contain a noncancellation clause and be valid at all times during demolition or moving operations.

Exception:

Homeowners for the demolition of Group R3 or U Occupancies when approved by the Agency.

127.3.1 Insurance amounts. The minimum amount of insurance to be provided shall be as follows:

CONTRACTOR INSURANCE COVERAGE

Class A Wrecking	$500,000.00
Class B Wrecking	$300,000.00
House Moving	$300,000.00

Additional insurance coverage may be required by the Office of Risk Management for contractors utilizing explosives in their demolition operations.

SECTION 128
LICENSE AND REGISTRATION CHANGES

128.1 Change of Name. The change of name by a licensee or registrant shall be reported to the Agency within 15 days after making the change, on a form provided by the Agency. A $15.00 application fee shall be required.

128.2 Change of Address. A change of address of a licensee or registrant shall be reported to the Agency within 15 days after making the change.

128.3 New Licenses Required. A new license or registration shall be obtained within 30 days after the creation of a new legal entity, even through one or more of the members, officers or directors have a license or are registered.

128.4 Dissolution. The dissolution of a corporation, partnership or other legal entity, which has been licensed or registered, terminates the license or registration and no person may operate under that license or registration.

SECTION 129
SUSPENSION OR REVOCATION OF LICENSE

129.1 Authority. The Building Official may suspend or revoke a license when the licensee commits one or more of the following acts or omissions:

1. Fails to comply with any of the licensee responsibilities as outlined in this Code.
2. Conspires with any person to permit a license to be used by another person.

3. Acts in any capacity with persons to evade the provisions of this Code.
4. Willfully violates or disregards any of the provisions of this Code.
5. Intentionally fails to perform in accordance with any written contract to perform work, which is regulated by this Code.
6. Creates, as a result of work performed, an unsafe condition as defined in Chapter 1 of this Code.
7. Intentionally or fraudulently misrepresents the condition of any structure or utility, or the requirements of this Building Code.
8. Repeatedly violates the provisions of this Code or repeatedly fails to obey orders in a timely fashion.

129.2 Procedure. When any of the acts or omissions enumerated herein is committed by a license holder and the Building Official deems that the license shall be suspended or revoked, the action shall be as follows:

1. **Notification.** The Agency shall send written notice to the license holder, by certified mail or by personal service, identifying the acts of omission and indicating that the license will be suspended or revoked. The written notice shall advise the license holder that a "Request for Hearing" may be initiated as outlined in item 2.
2. **Request for Hearing**. Upon receipt of the notice, the License holder may request a hearing to show cause why the License should not be suspended or revoked. This request shall be in writing to the Building Official within 7 days after receipt of the notice.
3. **Time of Hearing**. If a hearing is requested by the License holder, the Manager shall notify the License holder of the time, date and place of the hearing. Suspension or revocation of the license shall be stayed until after the hearing. In the event the License holder fails to appear, the license may be suspended by the Manager.
4. **Attendance**. The License holder, the Agency and other interested parties may be in attendance at the hearing. Upon completion of the hearing, the Manager shall take all evidence available as a result of the Agency's investigation and all evidence presented at the hearing under advisement, and shall give written notice of the findings and ruling to the License holder by certified mail or personal service.
5. **Suspension or Revocation**. Unless the license is being suspended or revoked under the emergency provisions of Section 129.3, the suspension or revocation shall take effect:
   A. Seven (7) days after receipt by the Licensee of the notification unless a hearing is requested.
   B. Upon the return by the U.S. Postal Service of the notification as undeliverable or refused at the address maintained by the licensee with the Agency.
   C. If a hearing has been requested by the licensee which resulted in the affirming of the Building Official's decision to suspend or revoke the licensee's license, upon receipt by the Agency of the Manager's decision.

129.3 Emergency Suspension or Revocation. If the Building Official finds that cause exists for emergency suspension or revocation of a license and that continued work under the license could be hazardous to life or property, he may enter an order for the immediate suspension or revocation of the license, pending further investigation. The licensee may, within 7 days of receiving notice of the suspension, request a hearing before the Manager and such hearing shall be granted within 24 hours. The suspension or revocation is not stayed while the hearing is pending.

129.4 Time of Suspension or Revocation. Time of suspension may be up to one year. Time of revocation may be from one year to five years.

129.5 Delegation of Authority. The Manager may appoint a hearing officer to conduct the hearing. Final decision shall be rendered by the Manager.

129.6 Right to Appeal. Any final decision by the Manager may be reviewed in the manner provided by the Colorado Rules of Civil Procedure. See Section 114.

SECTION 130
CERTIFICATES

130.1 Definition. A Certificate of Qualification is authority to perform certain skills and is issued by the Agency on the successful completion of an examination. This certificate is not transferable. The term "Certificate" means Certificate of Qualification.

130.2 Reciprocal Certificate. The Agency may issue a certificate when the applicant has passed an examination equivalent, as determined by the Agency, to the examination given by the Agency for a Supervisor Certificate of Qualification and the applicant has submitted for Agency approval a completed BID application with supporting documents and required fees.

130.3 Certificate Application. Every applicant for a Certificate shall be required to complete a form provided by the Agency.

130.4 Examinations. All applicants for a Certificate shall have a written examination except for those who apply for a Construction D Supervisor Certificate, in which case they shall be examined for experience and training by a standard procedure established by the Agency. If an applicant who has successfully passed the examination given by the Agency fails to procure this Certificate within 180 days after notification, the Certificate shall be declared to be null and void and a new application and fee shall be filed.

130.5 Certified Supervisors.

1. Every supervisor required for a particular license shall be examined by the Agency, and if qualified, shall be issued a Supervisor Certificate of Qualification. The Certificate holder shall be entitled to perform and supervise the work in the particular skill for which he is qualified and certified. This Certificate is personal to that holder and shall not be construed to be a license.
2. The Certificate holder shall actively supervise the workmen of the licensee by whom he is employed in accordance with Section 122.4.

130.6 Certified Journeymen and Operators.

1. Every Journeyman and Operator required by this Code shall be examined by the Agency and, if qualified, shall be issued a Journeyman or Operator Certificate of Qualification. The Certificate holder shall be entitled to perform and supervise the work in the particular skill for which he is qualified and certified. This certificate is personal to that holder and shall not be construed to be a license.
2. The Certificate holder shall actively supervise the workmen of the licensee by whom he is employed in accordance with Section 132.

SECTION 131
CLASSIFICATION OF SUPERVISOR CERTIFICATE OF QUALIFICATION

A Supervisor Certificate for the particular work to be performed shall permit the holder to be a Supervisor under the licenses listed in Table No. 131.

TABLE NO. 131
CLASSIFICATION OF SUPERVISOR

Contractor License	Supervisor Certificate Required
Building Class A	Construction Class A
Building Class B	Construction Class A or B
Building Class C	Construction Class A, B or C
Building Class D	Construction Class D
Access Control System	Access Control System
Boilermaker	Boilermaker
Demolition Class A	Demolition Class A
Demolition Class B	Demolition Class B
Electrical Registration	NOT REQUIRED
Electrical Signal	Electrical Signal
Elevator	Elevator
Fire Protection Class A	Fire Protection Class A
Fire Protection Class B	Fire Protection Class A or B
Fire Protection Class C	Fire Protection Class A or C
Gas Service	Gas Service or Heating and Ventilating Class A or B
Heating & Ventilating Class A	Heating & Ventilating Class A
Heating & Ventilating Class B	Heating & Ventilating Class A or B
Hot Water	Hot Water or Steam and Hot Water
Moving	Moving
Plumbing Class A	State of Colorado Master Plumber's License
Refrigeration Class A	Refrigeration Class A
Refrigeration Class B	Refrigeration Class A or B
Sign	Sign
Steam and Hot Water	Steam and Hot Water
Water Service	Water Service or State of Colorado Master Plumber's License

SECTION 132
CLASSIFICATION OF JOURNEYMAN AND OPERATOR CERTIFICATE OF QUALIFICATION

132.1 General. Unless otherwise provided for in this Section or in this Building Code, all journeymen and operators required to be certified shall perform that work permitted under the provisions of licenses for a particular type of work. The work permitted by the certification shall be performed in the employ of the licensee as hereinafter set forth.

132.2 Journeyman Certificate of Qualification. A Journeyman Certificate of Qualification shall be required in the following trades and shall entitle the individual to work only in the trade for which he is certified under a Certified Supervisor:

1. **Journeyman Boilermaker Certificate.** Permits the installation and erection of steam and hot water boilers, pressure vessels, precipitators, incinerators, breeching, chimneys, plate and casings. The holder of this Certificate may perform this work only in the employ of a Boilermaker Contractor.
2. **Journeyman Electrical Signal Certificate.** Permits the installation of electrical wiring and equipment for fire alarm, fire detection, emergency voice communication system, and electrical signaling and control wiring. Voltages shall not exceed 48 volts or the system shall be power limited as defined in the National Electrical Code.

Complete conduit or raceway systems shall not be installed by the holder of this Certificate. The holder of this Certificate shall perform this work only in the employ of an Electrical Signal Contractor.

3. **Journeyman Gas Service Certificate.** Permits the installation of the following equipment utilizing gas or liquid fuel:

   A. Gas and liquid fuel piping. The low-voltage wiring permitted by this Certificate shall apply to gas or liquid fuel-fired appliances only. The holder of this Certificate may perform this work only when in the employ of a Gas Service Contractor or a Heating and Ventilating Contractor Class A or B.

   B. Gas and liquid fuel controls.

   C. Commercial cooking equipment.

   D. Afterburners.

   E. Ranges.

   F. Dryers.

   G. Conversion burners.

   H. Venting of domestic water heaters, dryers and incinerators.

   I. Water heaters not exceeding 100 Btu input.

   J. Low-voltage wiring which does not exceed 48 volts and is not enclosed in a conduit or raceway.

4. **Journeyman Heating and Ventilating Certificate.** Permits the installation of warm air heating, ductwork, ventilation and evaporative cooling, exterior sheet metal, water heaters not exceeding 100 Mbtu input, gas piping, burners, venting and controls, exhaust systems and appurtenances thereof, and low-voltage wiring which does not exceed 48 volts and is not enclosed in a conduit or raceway. The holder of this Certificate may perform this work only in the employ of a Heating and Ventilating Contractor Class A or B.

5. **Journeyman Refrigeration Certificate.** Permits the installation of refrigeration systems and appurtenant cooling towers, pipe insulation and low-voltage wiring which does not exceed 48 volts and is not enclosed in a conduit or raceway. The holder of this Certificate may perform this work only in the employ of a Refrigeration Contractor Class A or B.

6. **Journeyman Steam Fitter Certificate**. Permits the installation of steam and hot water heating systems; solar water heating; process and industrial piping and related appurtenances; piping used for the transmission of chemicals, gases, air, milk and other products transmitted through piping; and all items regulated by the Mechanical and Plumbing Code for boilers, pressure vessels, steam and water heating systems and process piping; low-static gas-fired unit heaters; industrial ovens; burners, piping and controls utilizing gas; low-voltage wiring which does not exceed 48 volts and is not enclosed in a conduit or raceway; commercial cooking equipment; commercial incinerators; and afterburners. The holder of this Certificate may perform this work only in the employ of a Steam and Hot Water Contractor or a Hot Water Contractor.

132.3 Stationary Engineer and Operator Certificates. It shall be unlawful to operate any of the following equipment without the personal attendance of a properly Certified Stationary Engineer or a properly Certified Operator:

1. Any steam boiler and appurtenances thereto, steam pumps, steam turbines, and steam engines where the steam pressure is in excess of 15 psi working pressure and where the equipment produces a total of 10 boiler horsepower or more at Denver altitude.

2. Water heating systems when the water temperature exceeds 250 degrees F. in the system.

3. Refrigeration systems having manual or semiautomatic control with charges of 1500 lbs. or more of Safety Group A1 or B1 refrigerants as outlined in the Mechanical Code.

4. Built-up grouping of multiple refrigeration units where the refrigeration system charge is 1500 lbs. or more of Safety Group A1 or B1 refrigerants as outlined in the Mechanical Code.

5. Refrigeration systems utilizing refrigerant other than Safety Group A1 or B1 as defined in the Mechanical Code and which contains a charge of 200 lbs. or more. NOTE: As used in this Section, "semiautomatic" shall mean plants or

systems which are provided with automatic safety controls by manual load proportioning controls requiring other than seasonal adjustments.

Exception:

Personal attendance shall not be required for refrigeration units, which are categorized in items 3 and 4 that:

1. Have fully automatic safety controls which will shut down the unit when any one of the following conditions are detected:
   A. Excessive pressure in condenser.
   B. Excessive amperage draw.
   C. Improper voltage balance.
   D. Minimum temperature protection in evaporator.
2. Are located in a mechanical room that is in compliance with IMC Chapter 11.
3. Have immediate auto-dial notification to an approved constantly attended location.
4. Have annual testing and calibration of all operating and safety controls as required by the manufacturers' specifications. Records shall be maintained and available for inspection by this Agency and the Fire Department.
5. Have refrigerant vapor detectors that have local audible or visible alarm located inside and outside of the refrigeration equipment room.
6. Have all safety controls that have individual manual reset to be reset only by a Certified Stationary Engineer, Refrigeration Operator or Refrigeration Journeyman/Supervisor. The control limits shall be as required by the manufacturers specifications for the specific refrigeration unit.

132.4 Stationary Engineer Certificate. Permits the holder to take charge of and operate all steam boilers and appurtenances hereto, steam pumps, steam turbines, steam engines and mechanical refrigeration systems.

132.5 Boiler Operator Certificate, Class A. Permits the holder to take charge of and operate all steam boilers and appurtenances, steam pumps, steam turbines and steam engines.

132.6 Boiler Operator Certificate, Class B. Permits the holder to take charge of and operate all steam boilers and appurtenances, steam pumps, steam turbines and steam engines containing a steam pressure between 15 and 100 psi and where the equipment produces a total of between 10 and 100 horsepower at Denver altitude.

132.7 Refrigeration Operator Certificate. Permits the holder to take charge of and operate mechanical refrigeration systems.

132.8 Hoist Operator Certificate. It shall be unlawful to operate a construction hoist powered by steam, electricity or other power when such hoist serves buildings or structures under construction or demolition exceeding 25 feet in height unless said hoist is operated by a properly Certified Hoist Operator. This Section shall not be construed to include elevators as regulated and defined in this Code.

Exception:

Single drum material hoists not more than 25 feet in height and not carrying personnel do not require a Hoist Operator Certificate Holder.

SECTION 133
APPRENTICES AND TRAINEES

133.1 General. This Section shall govern the crafts listed in this Chapter where a Journeyman Certificate holder is required.

133.2 Requirements. Apprentices and trainees shall not be required to possess a Certificate, but shall be permitted to work as prescribed in other Sections of this Chapter.

133.3 Definition.

1. An "apprentice" shall mean any person who has entered into an apprentice agreement which provides for participation in a program of training through employment and education in related and supplementary subjects.
2. A "trainee" shall mean any person working at the trade under the direct supervision of a certified Journeyman or Supervisor.

133.4 Work. An apprentice or trainee may perform any work which is distinctive to a specific craft, but only under the direction and supervision of a Certified Supervisor or Journeyman of the craft, during working hours. Persons working on tasks not distinctive to any specific craft shall not be classed as an apprentice.

133.5 Employment of Apprentices. Contractors may employ apprentices or trainees for the licensed crafts or trades. The ratio of apprentices and trainees to Journeyman or Master Electrician employed shall not exceed one apprentice or trainee to one Journeyman or Master Electrician. The ratio of plumbing apprentices or trainees shall be 3 apprentices or trainees to one Master Plumber or Journeyman.

133.6 Employer. All apprentices or trainees shall be in the employ of the licensed crafts where Journeymen Certificate holders are required.

SECTION 134
CERTIFICATE FEES

134.1 Fees. Certificates of Qualification fees shall be paid every 3 years to the Agency in the amount as follows:

Supervisor Certificate	$60.00
Journeyman Certificate	$40.00
Engineer Certificate	$40.00
Operator Certificate	$40.00

Exception:

The certificate fees for employees of the City shall be waived when performing work for the City or when employed by the Agency.

134.2 Certificate Fee Refund. Certificate fees are not refundable.

SECTION 135
CERTIFICATE RENEWAL

135.1 Renewal and Expiration. Certificates shall be renewed every 3 years and expire on the date specified on the Certificate. No work shall commence or continue after the date of expiration.

SECTION 136
REISSUANCE

136.1 General. The Agency shall have the authority to renew a Certificate, provided that the renewal is accomplished within the limits set forth herein.

1. The Certificate may be reissued without a new application, provided that such reissuance is accomplished within one year after the Certificate has expired.
2. If the Certificate holder reapplies within 3 years of the date of expiration, a new Certificate examination shall not be required.
3. If the Certificate holder applies more than 3 years after expiration, a new Certificate examination shall be required.

SECTION 137
CERTIFICATE HOLDER RESPONSIBILITY

137.1 General. All Certificate holders shall be responsible to insure that the work performed by the licensee is in accordance with the requirements of this Code, without limitation, and to:

1. Have in possession at all times a Certificate.
2. Present a Certificate when requested by the Agency.
3. Faithfully construct without departure from or disregard of approved drawings and specifications.
4. Obey any order issued under authority of this Code.
5. Pay any fee assessed under the authority of this Code.
6. Observe the safety requirements of this Code.
7. Actively supervise and oversee all work performed by or for the licensee by whom he is employed.
8. Be responsible for all permits being issued prior to the beginning of work.
9. Maintain a current local mailing address and accept all mail so addressed.
10. Out of state Certificate holders shall maintain a current local mailing address on file with Contractor Licensing and accept all mail so addressed for the duration of the job.
11. Notify the Agency within 3 days whenever he leaves the employ of licensee.
12. Provide minimum safety measures and equipment to protect workmen and the public.
13. Faithfully construct, without departure from drawings and specifications filed and approved by the Agency and permit issued for same, unless changes are approved by the Agency.
14. Complete all work authorized by the permit issued under the authority of the Agency, unless the cause of incomplete work is determined by the Agency to be not the fault of the Certificate holder.
15. Obtain inspection services where required by the Agency.

SECTION 138
SUSPENSION OR REVOCATION OF CERTIFICATE

138.1 Authority. The Building Official may suspend or revoke a Certificate for any one or more of the following acts or omissions:

1. Incompetence.
2. Misuse of the Certificate.
3. Failure to comply with any of the Certificate holder responsibilities outlined in Section 137.
4. Knowingly conspire with a person to permit a license to be used by another person.
5. Act as agent, partner, associate or in any capacity with persons to evade the provisions of this Code.
6. Intentionally or fraudulently misrepresent the condition of any structure or utility or the requirements of this Code.
7. Create, as a result of work performed, an unsafe condition as defined in Chapter 1 of this Code.
8. Intentionally or fraudulently misrepresent the condition of any structure or utility or the requirements of this Code.
9. Repeatedly or willfully violate the provisions of this Code or repeatedly fail to obey orders in a timely fashion.

138.2 Procedures. When a Certificate holder commits any acts or omissions enumerated above and the Building Official deems that the Certificate shall be suspended or revoked, the action shall be as follows:

1. Notification. The Agency shall send written notice to the certificate holder, by certified mail or by personal service, identifying the acts of omission and indicating that the certificate will be suspended or revoked. The written notice shall advise the certificate holder that a "Request for Hearing" may be initiated as outlined in item 2.

2. **Request for Hearing.** Upon receipt of the notice, the Certificate holder may request a hearing to show cause why a certificate should not be suspended or revoked. This request shall be in writing to the Manager within 7 days after receipt of the notice.

3. **Time of Hearing.** If a hearing is requested by the Certificate holder, the Manager shall notify the Certificate holder of the time, date and place of the hearing. Suspension or revocation of the certificate shall be stayed until after the hearing. In the event the Certificate holder fails to appear, the Certificate may be suspended by the Manager.

4. **Attendance.** The Certificate holder, the Agency and other interested parties may be in attendance at the hearing. Upon completion of the hearing, the Manager shall take all evidence available as a result of the Agency's investigation and all evidence presented at the hearing under advisement, and shall give written notice of the findings and ruling to the Certificate holder by certified mail or personal service.

5. **Suspension or Revocation**. Unless the certificate is being suspended or revoked under the emergency provisions of Section 138.3, the suspension or revocation shall take effect:

   A. Seven days after receipt by the certificate holder of the notification unless a hearing is requested.

   B. Upon the return by the US Postal Service of the notification as undeliverable or refused at the address maintained by the certificate holder with the Agency.

   C. If a hearing has been requested by the certificate holder which resulted in the affirming of the Building Official's decision to suspend or revoke the certificate holder's certificate, upon receipt by the Agency of the Manager's decision.

138.3 Emergency Suspension or Revocation. If the Building Official finds that cause exists for the emergency suspension or revocation of a certificate and that continued work under the certificate could be hazardous to life or property, the Manager may enter an order for the immediate suspension of the certificate, pending further investigation. The certificate holder may, within 7 days of receiving notice of the suspension or revocation, request a hearing before the Manager and such hearing shall be granted within 24 hours. The suspension or revocation is not stayed while the hearing is pending.

138.4 Time of Suspension or Revocation. Time of suspension may be up to one year. Time of revocation may be from one year to five years.

138.5 Delegation of Authority. The Manager may appoint a Hearing Officer to conduct the hearing. The final decision shall be rendered by the Manager.

138.6 Right to Appeal. Any final decision by the Manager may be reviewed in the manner provided by the Colorado Rules of Civil Procedure. See Section 114.

SECTION 139
EXAMINATION STANDARDS AND REVIEW

139.1 Examination Standards. The Agency shall develop standards for the examination of applicants for Certificates. The standards shall be consistent with the purpose of this Code, which is to provide for the public health, safety and welfare to the extent that those persons examined are to be found qualified in terms of their skills, Building Code knowledge, practical experience and knowledge of pertinent laws to perform the construction work for which they may be certified.

1. The Agency shall examine applicants in the following areas:

   A. Applicable areas of the Code.

   B. Technical knowledge.

   C. Skills.

2. The Agency shall establish minimum standards for education and experience of the applicants.

139.2 Citizen Review Board. The Agency may establish an examination standards Citizen Review Board to review and monitor the examination testing criteria. The Citizen Review Board members shall be representatives of the various segments of the construction industry, which are pertinent to the specific certification examinations.

139.3 Annual Review. The Standards shall be reviewed annually or more frequently if necessary to maintain the standards current with changes in the Code and building construction practices.

Sections 140 through 149 are reserved.

SECTION 150
PERMITS, PLANS, INSPECTIONS, CERTIFICATE OF OCCUPANCY

150.1 Permits required. No person, business, corporation, agency or public, private or governmental institution shall erect, construct, enlarge, remodel, alter, repair, move, improve, remove, convert, demolish or change the occupancy of any building, structure or utility, or perform any other work regulated by this Code, or cause the same to be performed, in the City, without first having obtained a permit from the Agency for the specific work to be performed. This permit shall be displayed or available on the job site at all times.

150.1.1 Pedestrian protection. The erection of covered walkway and railings for the protection of pedestrians around a construction, demolition or moving site.

150.2 Exempted Work. The following construction is exempt from the permit requirements of this Code. Exemption from this Code shall not be deemed to grant authorization for any work to be done in any manner that violates the provisions of this Code or any other laws or ordinances of this jurisdiction. Wastewater Management, Zoning Administration and Fire Department permits may be required.

1. One-story detached accessory buildings or structures used as tool and storage sheds, playhouses and similar uses, provided that the projected roof area does not exceed 120 square feet (11 m^2) and a maximum height of 8 feet.
2. Fences of any type not over 4 feet (1220 mm) high. Posthole-dug fences up to 8 feet (2440 mm) high, such as chain link, cedar pine, redwood and wrought iron.
3. Oil derricks.
4. Nonfixed and movable fixtures, cases, racks, counters and partitions not over 5 feet 9 inches (1750 mm) high.
5. Retaining walls which are not over 4 feet (1220 mm) in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge or impounding Class I, II or III-A liquids.
6. Water tanks supported directly upon grade where the capacity does not exceed 5,000 gallons (18,930 L) and the ratio of height to diameter or width does not exceed 2 to 1.
7. Sidewalks and driveways less than 30 inches (760 mm) above grade and not over any basement or story below and are not part of an accessible route. Uncovered decks less than 30 inches above grade and accessory to one and two family dwellings and townhomes.
8. Painting, papering, tiling, floor coverings, countertops, carpeting, cabinets, curtains, drapes and similar decoration items except those items regulated by Chapter 8, IBC.
9. Temporary motion picture, television and theater stage sets or scenery.
10. Window awnings supported by an exterior wall of one and two family dwellings and townhomes and Group U Occupancies when projecting not more than 54 inches (1370 mm) over privately owned property.
11. Prefabricated swimming pools accessory to one and two family dwellings and U Occupancies in which the pool walls are entirely above the adjacent grade and when utilities are provided.
12. Public utility: Construction, repair or maintenance of public utility equipment and facilities used in the distribution of their utility. This exemption includes buildings whose primary function is to house utility distribution or signal control equipment and not intended for human occupancy. RTD: Traction power substations, signal/communication relay stations and houses and associated conduit and wiring for the operation of the light rail lines, the installation of the light rail tracks and associated passenger platforms on RTD right-of-way.
13. State and federal governments, their agencies or subdivisions, or contractors constructing improvements for said state and federal governments, their agencies or subdivisions, when constructing improvements to be used for and maintained entirely and strictly for the operation of said governments.

14. Replacement of glass not in hazardous locations (see IBC Section 2406.2).
15. Site development work including grading, water detention/retention ponds and soil erosion control. The Wastewater Division will require permits for this type of work.
16. Denver Public Schools (D.P.S.): Construction, remodeling or repair of any plumbing or electrical system, except for fire alarm and detection systems, in any portion of a building in which instruction is or will be given by any D.P.S. school as long as such work is permitted and inspected by the State Examining Board of Plumbers or the State Electrical Board.
17. All plumbing fixture replacement or repair.
18. Tents, 200 sq. ft. or less and freestanding canopies 400 sq. ft. (37 m^2) or less, open on 3 or more sides.
19. Membrane structures, including tents and canopies of any size, erected for a period of less than 180 days.
20. Nonilluminated signs of the following types:
    a. Cloth signs mounted directly on a wall.
    b. Wall signs not exceeding 200 sq. ft. (19 m^2) in area.
    c. Ground signs not exceeding 150 sq. ft. (14 m^2) in area, or not exceeding 6 feet in height to the top of the sign.
    d. Arcade signs not exceeding 25 sq. ft. (2.3 m^2) in area on each side.
21. Replacement of awning fabrics.
22. Replacement of windows with no structural alterations and no change in size of opening in one and two family dwellings and townhomes. When structure is a designated structure for preservation or is located in a district for preservation pursuant to Chapter 30, Denver Revised Municipal Code, a building permit and approval from the Landmark Preservation Commission shall be required.
23. Swings and other playground equipment.

150.2.1 Mechanical. No Permit Required For:

All general repairs and replacements of like units unless the work involves disconnection and reconnection of any of the following:

1. Natural gas line (except replacement of gas valve with like unit).
2. Flue vent from fuel-fire appliance.
3. Refrigerant line.
4. Steam line or hot water line.
5. Safety controls on high pressure boilers.

No mechanical permit shall be required for bath fan installation in existing one and two family dwellings and townhouses, however, electrical and construction permits shall be required.

150.2.2 Electrical. No Permit Required For:

1. All general replacements of existing electrical appliances and/or apparatus with like units, or general repairs that do not involve altering or changing the electrical system.
2. General Repairs that do not involve altering or changing the electrical system.
3. Reconnection of furnaces and air conditioning units in one and two family dwellings and townhouses.
4. No permit shall be required from Building Permitting and Inspection Services for non-required fire alarm systems in one and two family dwellings and townhouses, however, permits for non-required fire alarm systems in one and two family dwellings and townhouses shall be issued and inspected by the fire department.

Exceptions:

1. Permits are required for any work on emergency engine-generator sets, emergency transfer switches, emergency system feeders and circuits, and emergency system overcurrent devices.

2. Permits are required for any work on fire alarm systems, fire detection systems or automatic fire-extinguishing systems.

3. Permits are required for any work on service entrance equipment.

150.2.3 Plumbing. No Permit Required For:

1. Single-family homes, duplexes, townhouses – general repairs that do not alter existing systems, including replacement of like units such as bathroom/kitchen sinks, garbage disposals and water closets.

2. Commercial buildings – replacement of sinks, garbage disposals and water closets with like units; faucet and trap replacement or repair. Permit required for all other plumbing work in commercial buildings.

SECTION 151
PERMITS

151.1 Application.

1. The owner or the owner's agent shall apply for a permit on forms furnished by the Agency. The applicant should exercise care in completing the necessary information, especially addresses, as permits are nontransferable, unless the address change is approved by the Plan Review Section of the Agency.

Exception:

The Agency may correct minor errors in the address if the change can be made on all copies of the permit and initialed by the inspector.

2. The contractor's signature is not required on the permit application when the construction documents are submitted to the Agency for review.

151.2 Issuance of Permits. The Agency shall issue permits to perform the work shown on submitted documents and as specified on the permit when the following conditions are met:

1. All phases of the project conform to the requirements of this Code, Department of Public Works, Zoning Permitting & Inspection, Environmental Health Inspection Division and Fire Department; and

2. The permit form is signed by one of the following before the permit is issued:

   A. A contractor that is licensed under Chapter 1 of this Code;

   B. An owner applying for a permit under Subsection 151.2.3; or

   C. An owner or owner's agent applying for permits under Subsection 151.2.4.

3. When the applicant is a natural person who owns and occupies a single-family dwelling, a unit of a duplex, a Group U Occupancy or a dwelling unit in a townhouse building, a homeowner’s permit may be issued to the applicant for additions, alterations and repairs to that unit. When applicant in the above noted category desires to construct a single family dwelling or an accessory use Group U Occupancy for his ownership and occupancy, a homeowner’s permit may be issued to the applicant for the construction of the dwelling. Such homeowner permit to construct a single family dwelling may be issued once in a five year period to the applicant or family member.

   All work shall be done under the supervision of the applicant of the homeowners permit and the applicant shall be ultimately responsible for the work.

   Any work done under a homeowner's permit, including demolition of a dwelling or Group U occupancy structure, shall be done by the owner personally unless otherwise approved by the Agency.

Exceptions:

A. A permit shall not be issued to the owner of a townhome unit for structural alteration.

B. The applicant for a permit to perform electrical, heating, cooling or plumbing work shall pass an examination related to the work being performed and shall personally perform the work, unless approved by the Agency. Upon verification of their State issued electrical or plumbing license, the applicant will not be required to take the homeowner’s examination. A helper may assist the homeowner in taking the examination and performing the work. The helper may not repeatedly act in this capacity for other homeowners’ permits.

C. A permit for minor work involving the volunteer services of persons working through a recognized volunteer organization, or of other qualified individuals, may be issued to the applicant of a single-family dwelling, duplex or miscellaneous building. A request for permit shall be in writing and shall be issued only when approved by the Building Official.

4. When the applicant is the owner or owner's agent of a Group R-1, R-2, R-3 or R-4 occupancy building for the purpose of installing battery-operated smoke detectors.

5. Any work to the exterior or common elements of a townhouse or condominium apartment building must be approved by the Homeowner's Association and the permit issued to a licensed contractor.

6. The applicant is an owner or owner's agent to establish a new certificate of occupancy when no construction work is to be done.

7. Payment of the Systems Development Fee established by the Gateway Regional Metropolitan District and imposed on all land within such District.

8. Evidence of the payment of fees established by the Gateway Village General Improvement District and imposed on all land within such District.

9. Evidence of payment of any impact fees applicable pursuant to Article III of Chapter 50 of the Denver Revised Municipal Code for properties within the Gateway impact fee area.

151.3 Non-transferable. Permits shall be non-transferable.

Exception:

Permits for improper address issued to the same contractor may be transferred. A processing fee of $25.00 per permit will be charged. Requests for transferable permits must be made within 30 days of issuance of the original permit.

151.3.1 Cancellation of the permit by contractor. The contractor may cancel the permit by notifying the Building Inspection Division. The owner shall appoint a new contractor to complete the work and provide a written statement regarding the change of contractor. The new contractor shall obtain a new permit for the work to be completed. An administrative fee of $100 will be charged. Additional administration, plan review and inspection fees may be charged to recover the cost incurred by the Agency.

151.3.2 Replacement of Contractor Set. A set of Agency approved, stamped drawings are required to be posted at the job site. If Contractor Set is misplaced the following are required to obtain a copy of the Agency's stamped Record Set of drawings:

1. A release from the architect / engineer of record.
2. A copy of the original permit.
3. An administrative fee of $50 will be charged.

Once plans have been retrieved by the Agency, they will be released to the contractor for copying at the contractor's expense. Failure to return the Agency's drawings may result in the suspension of the contractor's license.

151.4 Validity. The issuance of a permit or the approval of drawings and specifications shall not be construed to be a permit for, nor an approval of, any violation or deviation from the provisions of this Code or other ordinances, laws, rules or regulations. The Agency shall take any action it deems necessary to ensure that all work performed meets all requirements of this Code.

151.5 Suspension-Cancellation-New Permits.

1. The Agency may cancel a permit when:
   A. Work is not commenced within 60 days from the date of issuance unless this time is extended by the Agency.
   B. Work is suspended or abandoned for a period of 60 days after work is commenced unless this time is extended by the Agency.
   C. No request for inspection has been made for a period of 60 days unless this time is extended by the Agency.
2. A demolition or moving permit may be canceled by the Agency when:

A. Work is not commenced within 30 days after the date of issuance.

B. Work is suspended or abandoned for a period of 10 days after work is commenced unless otherwise approved by the Agency.

3. A new permit may be issued to replace an expired permit, provided that no changes have been made in the original drawings and specifications for the work, when:

   A. The holder of a canceled permit demonstrates that the suspension or abandonment of work was occasioned by circumstances beyond his control and that it would be an injustice to require a new fee; or

   B. Payment of a fee equal to ½ the current permit fee, provided that the application is made within one year after cancellation.

4. The Agency may suspend or cancel any permit or may stop the work for any of the following reasons:

   A. Whenever there is a violation of any provisions of this Code or any City ordinance which the Agency is empowered to enforce.

   B. When the owner or permit holder has failed to comply with the requirements of the Department of Public Works, Zoning Administration, Public Health Inspection Division and the Fire Department.

   C. Whenever the continuance of any work becomes dangerous to life or property.

151.6 Notice. Notice of the suspension or cancellation for reasons stated in Subsection 151.5 shall be in writing and shall be served upon the holder of the permit, the owner or the person in charge of the work. If the original notice is not served on the owner, a copy of the notice shall be sent to the owner. It shall be unlawful to proceed with any work once the notice is served.

SECTION 152
PERMIT FEES

152.1 Permit Fees. The fee for each permit shall be as set forth in Table No. 152.1. The determination of value or valuation under any of the provisions of this Code shall be made by the Building Official. The value to be used in computing the building permit and building plan review fees shall be the total value of all construction work for which the permit is issued, as well as all finish work, roofing, electrical, plumbing, heating, air conditioning, elevators, fire-extinguishing systems and any other permanent equipment. Permit fees provide for the customary inspections only.

In order to encourage energy conservation, water conservation and reduction of air pollution, the Building Official is authorized to waive or reduce the permit fees for the installation of equipment or appliances which meet the standards for achieving conservation of energy or water or which may reduce air pollution. Such waivers shall be in writing and shall be for a specific period of time.

When the "valuation" is in question, the Building Official shall use the latest "Building Valuation Data" table as published in the ICC "Building Safety" publication.

TABLE NO. 152.1
FEE SCHEDULE - BUILDING PERMIT FEES

VALUATION OF WORK	PERMIT FEE	PLAN REVIEW %
$1.00 to $500.00	$20.00	0%
$501.00 to $2,000.00	$35.00	0%
$2,001.00 to $25,000.00	$35.00 for the first $2,000.00 plus $8.00 for each additional $1,000.00 or fraction thereof, to and including $25,000.00	50%[1]
$25,001.00 to $50,000.00	$220.00 for the first $25,000.00 plus $8.00 for each additional $1,000.00 or fraction thereof, to and including $50,000.00	50%[1]
$50,001.00 to $100,000.00	$420.00 for the first $50,000.00 plus $7.00 for each additional $1,000.00 or fraction thereof, to and including $100,000.00	50%[1]
$100,001.00 to $500,000.00	$770.00 for the first $100,000 plus $5.60 for each additional $1,000.00 or fraction thereof, to and including $500,000.00	50%[1]
$500,001.00 to $1,000,000.00	$3,010.00 for the first $500,000.00 plus $4.75 for each additional $1,000.00 or fraction thereof to and including $1,000,000.00	50%[1]
$1,000,001.00 and over	$5,385.00 for the first $1,000,000.00 plus $3.65 for each additional $1,000.00 or fraction thereof.	50%[1]
[1] Walk-through and type approved plans will be charged at the rate of 10%, with a minimum of $50.00 per approved plans.		

OTHER FEES		
Building Moving	Per Each Address	$100.00/hour
1. Inspections outside of normal business hours (minimum charge of 2 hours).		$100.00/hour
2. Reinspection fees assessed under provisions of Section 157.7 (minimum charge 1 hour)		$ 75.00/hour
3. Inspections required by the Agency for which no fee is specifically indicated.		$ 50.00/hour
4. Additional plan review fee for review of modifications to approved plans		$ 75.00/hour
[2] The Agency may charge the hourly cost incurred by the inspection or plan review if greater than the hourly rate above.		

152.2 Plan Review Fees. When submittal documents are required by Section 153.1, a plan review fee shall be paid at the time of submitting the submittal documents for plan review. Said plan review fee shall be the percentage of the building permit fee as shown in Table No. 152.1. Where plans are essentially incomplete and not in accordance with Sections 153, 154 or 155 or changes are made which require additional plan review, an additional fee shall be charged at the rate shown in Table No. 152.1. The plan review fees specified in this Section are separate fees from the permit fees specified in Section 152.1 and are in addition to the permit fees

152.3 Type Approval. When construction documents have been approved for a typical structure and duplicate structures are to be constructed on the same site by the same contractor, a plan review fee shall be paid at the rate of 10% of permit fee in Table No. 152.1. See footnote 1 in Table No. 152.1.

152.4 Expiration of Plan Review. If no permit is issued within 180 days following the date of application, the application shall expire and plans and other data submitted for review may thereafter be returned to the applicant or destroyed by the Building Official. The Building Official may extend the time for action by the applicant for a period not exceeding 180 days upon a written request showing that circumstances beyond the applicant's control have prevented action from being taken. Additional extensions may be granted by the Building Official upon written request. In order to

renew action on an application after expiration, the applicant shall submit a new application with the plans and pay a new plan review fee.

152.5 Allowed Inspections. Permit fees provide for the customary inspections only.

152.6 Late Fees. When work for which a permit is required by this Code is started without a permit, the permit fees stated in Table No. 152.1 shall be doubled with a minimum of $50, based on the work performed without a permit. The payment of this late fee shall not relieve any person from fully complying with the requirements of this Code in the execution of the work or from other penalties for performing work without a permit.

Exception:

For items of work performed on an emergency basis, as determined by the Agency, to maintain an existing service or utility when the maintenance is necessary to protect health, life or safety, the penalties stated herein shall not apply if application for a permit is made within 3 normal working days after commencement of the emergency work.

152.7 Permit Fees for Denver Agencies. Enterprise Fund agencies of the City and County of Denver which are not subsidized by the General Fund shall pay permit fees for all construction and repair work for which building permits are required. General Fund agencies and Enterprise Fund agencies subsidized by the General Fund shall pay permit fees for new construction projects only.

152.8 Additional Fees. A supplementary permit shall be obtained for any additional valuation not included in the original permit. The fee shall be the difference between the fee paid and the fee that would have been required had the original permit included the entire valuation.

152.9 Additional Plan Review Fees for Rejected Drawings. When drawings are rejected, an additional fee shall be charged in accordance with Table No. 152.1. When submittal documents are incomplete or changed so as to require additional plan review or when the project involves deferred submittal items as defined in Section 154.1.3.A, an additional plan review fee shall be charged at the same rate shown in Table No. 152.1.

152.10 Refunds. No refund will be granted for any permit fee paid to the Agency.

Exception:

Fees for duplicate or out-of-City permits may be refunded. A processing fee of $25.00 per permit will be charged and that amount will be deducted from the refund. Request for refund must be made in writing within 60 days of the date of the permit.

152.11 Investigation for Work Without a Permit. Whenever any work for which a permit is required by this Code has been commenced without first obtaining a permit, a special investigation shall be made before a permit may be issued for the work.

152.12 Investigation Fee. An investigation fee shall be collected when work has begun without a permit. The investigation fee shall be equal to the amount of the permit fee required by this Code. The minimum investigation fee shall be the same as the minimum fee set forth in Table No. 152.1. The payment of such investigation fee shall not exempt any person from compliance with all other provisions of this Code nor from any penalty or fees prescribed by law.

SECTION 153
DRAWINGS AND SPECIFICATIONS

153.1 General. Drawings and specifications shall be required for review and approval by the Agency prior to the issuance of a permit, except as set forth in Subsection 153.6.

153.2 New Construction, Additions, Alterations or Repairs. Application for a permit shall be accompanied by the following:

1. Drawings including the information required in Section 155.
2. Copies of an engineering report containing studies and test results concerning the hazards present on the building, demolition or moving site when such site is within an area designated as a Special Construction Zone under Article VII, Chapter 10 of the Revised Municipal Code. Each report shall contain adequate information as a result of tests to allow identification of the hazards present and recommendations as to methods of minimizing the

hazards during construction and methods for controlling the identified hazards likely to be present after construction. The Public Health Inspection Division and the Fire Department shall approve all reports required by this Subsection before any permit is issued. Construction shall comply with Appendix K.

3. When required by the Agency, additional drawings shall be submitted for approval.

153.3 Approval. Drawings and specifications complying with the provisions of this Code and approved by the Agency shall bear the Agency stamp of approval. When corrections are required, the Agency may require that the drawings and specifications be revised and resubmitted for approval prior to the issuance of a permit.

153.4 Distribution. One set of approved drawings and specifications shall be returned to the Applicant and shall be kept on the job site until project is completed. One set of approved drawings and specifications shall remain in the office of the Agency.

153.5 Disposal. Upon completion of the work and the final inspections by the Agency, the Agency copy of the approved drawings and specifications may be disposed of after 6 years have elapsed from the date of issuance of the permit. If no permit is issued, plans and specifications may be disposed of after 180 days from the date of application.

153.6 Not Required. Drawings, specifications and an engineering report need not be submitted for the construction, demolition or moving of minor buildings, additions, structures or utilities; or for minor alterations and repairs to existing buildings, structures or utilities when the Agency is satisfied that the strength, safety, sanitation and fire resistance are adequately described on the permit application, or when it is satisfied that such construction, alterations, repair, demolition or moving will not substantially increase the hazard present in a Special Construction Zone.

153.7 Utility Companies. With the approval of the Agency, the design of buildings, structures or utilities for the authorized Public Utilities may vary from these Building Code requirements.

SECTION 154
PREPARATION OF DRAWINGS AND SPECIFICATIONS

154.1 Limitations. Any person may submit drawings and specifications with an application for a building permit, subject to the following limitations:

1. **Architect and/or engineer required.** Construction documents for all buildings, structures, additions, alterations or repairs shall bear the seal and signature of the design professional responsible for each design phase except as provided in Subsection 7.

   Exception:

   Sprinkler system shop drawings may bear the seal and signature of a NICET Level III or higher certified individual.

2. **Seal and Signature**

   A. The authorized seal shall be a crimp type, a rubber stamp type, or computer generated type. A seal must be applied to either the final reproducible or final reproduction of all of the following.

      1. Each sheet of drawings produced by or under the direct supervision of the design professional.
      2. The cover, title page and table of contents of specifications bound in book form.
      3. Each sheet of subsequent issues of revisions, addenda clarifications or other modifications.
      4. Title page of details bound in book form.
      5. Title or signature page of all engineering reports.

   B. The signature (manual or electronic) of the registrant and date of signature shall be affixed to the document. If a manual signature is used, the signature of the registrant and date of signature shall appear through the seal.

      1. Manual Signature. A manual signature is the handwritten name of a person applied to a document that identifies the person, serves as a means of authentication of the contents of the document, provides responsibility for the creation of the document and provides for accountability for the contents of the document.

2. Electronic Signature. An electronic signature is a digital authentication process attached to or logically associated with an electronic document and shall carry the same weight, authority, and effects as a manual signature. The electronic signature, which can be generated by using either public key infrastructure or signature dynamics technology, must be as follows.

   (i) Unique to the person using it.

   (ii) Capable of verification.

   (iii) Under the sole control of the person using it.

   (iv) Linked to a document in such a manner that the electronic signature is invalidated if any data in the document are changed.

   The use of an electronic signature must be pre-approved by the Agency.

3. Registered Design Professional in Responsible Charge. When it is required that documents be prepared by an architect or engineer, the Agency may require the owner to engage and designate on the building permit application an architect or engineer who shall act as the Registered Design Professional in Responsible Charge. If the circumstances require, the owner may designate a substitute registered design professional in responsible charge who shall perform all of the duties required of the original registered design professional in responsible charge. The Agency shall be notified in writing by the owner if the registered design professional in responsible charge is changed or is unable to continue to perform the duties. The registered design professional in responsible charge shall be responsible for reviewing and coordinating all submittal documents prepared by others, including deferred submittal items, for compatibility with the design of the building.

A. Deferred Submittals. For the purposes of this Section, deferred submittals are defined as those portions of the design which are not submitted at the time of the application and which are to be submitted to the Agency within a specified period. Deferral of any submittal items shall have prior approval of the Building Official. The registered design professional in responsible charge shall list the deferred submittals on the plans and shall submit the deferred submittal documents for review by the Agency. Submittal documents for deferred submittal items shall be submitted to the design professional in responsible charge who shall review them and forward them to the Agency with a notation indicating that the deferred submittal documents have been reviewed and that they have been found to be in general conformance with the design of the buildings. The deferred submittal items shall not be installed until their design and submittal documents have been approved by the Agency.

B. Inspection and Observation Program. When special inspection is required by Section 1704, the registered design professional in responsible charge shall prepare an inspection program which shall be submitted in the Agency for approval prior to issuance of the building permit. The inspection program shall designate the portions of the work that require special inspection and the name or names of the individuals or firms who are to perform the special inspections, and indicate the duties of the special inspectors. The special inspector shall be employed by the owner, the registered design professional in responsible charge, or an agent of the owner, but not the contractor or any other person responsible for the work. When structural observation is required by Section 158.2, the inspection program shall name the individuals or firms who are to perform structural observation and describe the stages of construction at which structural observation is to occur. The inspection program shall include samples of inspection reports and provide time limits for submission of reports.

4. Consultant Drawings. Consultant drawings and specifications prepared by architectural or engineering subdisciplines shall be so designated by their name, address and phone number and shall bear the seal and signature of the responsible architect or engineer for the subdiscipline.

5. Statement. When a design professional signs and seals a document, a statement shall also be included setting forth the aspects of the project for which the design professional is responsible (i.e., civil, structural, mechanical). If there is no statement, it is presumed that the design professional has assumed responsibility for the entire document.

6. Reproducible Drawings. The design professional's seal and signature shall not be placed on reproducible drawings that are used for multiple copies or on reproducible drawings that are transferred away from the design professional's possession and supervision.

7. **Architect or Engineer not Required**. An architect or engineer is not required to prepare drawings and specifications for the following buildings, structures, additions, alterations or repairs:

   A. One and two-family dwellings or miscellaneous buildings.

   B. Group R-2 Occupancies and townhouse buildings when the floor area of the building does not exceed 5,000 square feet and the building is not more than one story without basement or cellar.

   C. Garages, industrial buildings, warehouses, stores, mercantile buildings or office buildings where the floor area of the building does not exceed 5,000 square feet and the building is not more than one story, without a basement, cellar or excavated subfloor area.

   D. Nonstructural alterations, including alterations to utilities, approved by the Agency, which are to any building or structure, provided that the alterations do not affect the stability of the building or the health and safety of the occupants.

   E. If after review of the drawings and specifications, the Agency determines that the proposed building or structure is inadequately designed, the Agency may require that the drawings and specifications bear the seal of an architect and engineer who will be responsible for the design phases of the building or structure.

SECTION 155
INFORMATION REQUIRED FOR PREPARATION OF DRAWINGS

155.1 Information Required. Drawings and specifications shall be complete and of sufficient clarity to indicate the entire work proposed and to show in detail that the building, structure or utility conforms to the provisions of this Building Code and relevant laws, ordinances, rules and regulations. Each set of drawings and specifications shall contain at least the following: Architectural, Structural, Mechanical, Electrical Drawings, Specifications and Analysis:

1. The exact address, legal description and location of the work performed.
2. The name and address of the owner.
3. Name and address of the person or firm responsible for the preparation of the drawings and specifications. The seal and signature of the architect and or engineer responsible for the preparation of the drawings and specifications when required by Section 154.
4. A plot plan showing the location of the proposed construction and the location of every adjacent existing building on the property, roads, walks, utilities and other site improvements, all property lines, streets, alleys, easements and other public areas. A plot plan is not required for interior alterations and repairs. The proposed construction shall not project beyond property lines except as provided for in Chapter 32.
5. A completed "Building Profile Form." The form shall be provided by the Agency.
6. Two complete sets of construction documents showing the construction of architectural, structural, mechanical and electrical arrangements.
7. One copy of specifications or notes that clearly describe the type, quality and finish of materials and the method of assembly, erection and installation of equipment to be installed with proper reference to accepted standards.
8. Architectural drawings and specifications as follows:

   A. Plans showing the arrangement of each floor, elevations, sections and details to show the construction of all architectural features, including the location and type of fire-rated construction.

   B. The gross area in square feet of (1) buildings or portions of buildings in which new construction or remodeling work is intended; and (2) different occupancy groups.

   C. A complete Code Analysis, including the building occupancy groups, the type of construction, and a comparison of actual floor areas and number of stories to those allowed under the provisions of this Code on the front sheet of drawings.

   D. The construction documents shall show in sufficient detail the location, construction, size and character of all portions of the means of egress in compliance with the provisions of this code. In other than occupancies in

Groups R-2, R-3, as applicable in Section 101.2, and I-1, the construction documents shall designate the number of occupants to be accommodated on every floor, and in all rooms and spaces.

9. Structural drawings, specifications and analysis as follows:
   A. Design criteria indicating all lateral loads and allowable stresses in all structural materials.
   B. Foundation, floor and roof plans indicating (1) location of concentrated loads and varying live loads; (2) roof areas used to impound water; and (3) pressurized shafts required for Chapter 9.
   C. Elevations, sections and details showing all structural requirements.
   D. Foundation design criteria shall be submitted when requested by the Agency for all new construction in accordance with a soils investigation report signed and sealed by an engineer responsible for the preparation of the report.
10. Mechanical drawings, specifications and analysis as follows:
   A. Single line drawings, including typical isometric, of plumbing, heating, air treatment systems and gas piping layout.
   B. Btu rating of gas units, method of combustion and ventilation air supply, type and horsepower of refrigeration, and gas meter locations.
   C. Heating, cooling, ventilating, plumbing and fire protection details, and fire or smoke damper locations.
   D. Plans and details showing (1) the location of impounded water; and (2) shafts used for pressurization as required by Chapter 9.
   E. Construction documents for buildings more than two stories in height shall indicate where penetrations will be made for mechanical systems, and the materials and methods for maintaining required structural safety, fire-resistance rating and fireblocking.
11. Electrical drawings, specifications and analysis as follows:
   A. One-line diagram showing sizes of service and feeder conductors, sizes of service and feeder overcurrent devices, all major components of service and distribution system, ratings of equipment, and grounding details.
   B. Load study and analysis to justify sizes of system components.
   C. Short-circuit study and analysis to justify short-circuit withstand ratings of all system components.
   D. Panelboard circuit schedules including loads per each circuit, total bus load per phase, AIC rating and NEC demand calculations.
12. A field survey under Section 156 shall be required for all additions and new construction.
13. A complete elevator and dumbwaiter layout, if applicable.

155.2 Additional Information When Requested.

1. Reports from an independent testing agency, which substantiates requirements of this Code regarding structural or fire-resistive requirements.
2. Engineering design calculations.
3. Other information deemed necessary to determine compliance with the requirements of this Code.

SECTION 156
FIELD SURVEYS

156.1 General. A Land Survey Plat or an Improvement Survey Plat shall be conducted by a land surveyor registered by the State of Colorado for the construction of a new building or structure, an addition to an existing building or structure or a change of occupancy for an existing building or structure which shall include, but not be limited to the following information:

1. Scale drawing of the boundaries of the land parcel with all dimensions to establish those boundaries.

2. All recorded and apparent rights-of-way and easements.
3. Improvements locations shall be shown in scale with a minimum of 2 dimensions to the nearest property line to locate all improvements.

156.2 Access for Agency. The contractor or property owner shall provide unobstructed access for the Agency to the required corner stakes or markers.

SECTION 157
INSPECTIONS

157.1 General. All work for which a permit is required shall be subject to inspection by the Agency and all such work shall remain accessible and exposed for inspection until approved by the Agency. In addition, certain types of construction shall have continuous inspection as specified in Section 158. Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this Code or of other City ordinances. Inspections presuming to give authority to violate or cancel the provisions of this Code or of other ordinances shall not be valid. It shall be the duty of the permit applicant to cause the work to remain accessible and exposed for inspection. Neither the Agency nor the City shall be liable for expense entailed in the removal or replacement of any material required to allow inspection. A survey of the lot may be required by the Agency to verify that the structure is located in accordance with the approved plans.

157.2 Inspection Record Card. Work requiring a permit shall not be commenced until the permit holder or his agent has posted or otherwise made available an inspection record card so as to allow the Agency to conveniently make the required entries regarding inspection of the work. This card shall be maintained by the permit holder until final approval has been granted by the Agency.

157.3 Inspection Requests. It shall be the duty of the person doing the work authorized by a permit to notify the Agency when such work is ready for inspection. The Agency may require that every request for inspection be filed at least one working day before such inspection is desired and such request may be in writing or by telephone. It shall be the duty of the person requesting any inspections required by this Code to provide access to and means for inspection of such work. It shall be the duty of the Agency to conduct the inspections in a timely manner.

157.4 Approval Required. Approval by the Agency shall be required at progressive stages of the construction of the building or structure and the installation of the mechanical, plumbing and electrical systems. The Agency shall make the requested inspections and shall either approve that the completed portion of the construction is satisfactory or shall notify the permit holder or his agent that the same fails to comply with this Code. Any portion which does not comply shall be corrected and such work shall not be covered or concealed until approved by the Agency.

There shall be a final inspection and approval of all completed construction before the building, structure or portion thereof shall be ready for occupancy and use.

157.5 Required Inspections. The following inspections shall be required and shall be made by the Agency after proper notification. Other inspections may be required. See Sections 157.6 and 158.

1. **Foundation Inspection.**

   A. Footings. Inspections shall be conducted prior to pouring concrete. The footing excavation form work and any reinforcing steel must be in place. Any clay soil pipe encountered must be replaced with schedule 40 PVC, ABS/DWV or cast iron pipe by a licensed plumber, under a separate permit. All such work shall be approved by the Agency prior to the footing inspection.

   B. Walls. Concrete walls shall have the form work and reinforcing steel inspected prior to the concrete placement. Approved treated wood walls shall be inspected as required by AF&PA Technical Report 7-87.

   C. Waterproofing/Dampproofing Inspection. To be conducted after the waterproofing/dampproofing system or materials are completely in place and exposed for inspection.

   D. Exterior wall insulation and drain tile when required.

2. **Concrete slab or under-floor inspection**. To be made after all in-slab or under-floor building service equipment, conduit, piping accessories and other ancillary equipment items are in place, but before any concrete is placed or floor sheathing installed, including the subfloor.

3. **Frame Inspection**. To be conducted on the completed frame construction with all fire blocking and bracing in place. All framing must be exposed to view. Roof and wall sheathing or panel must be complete with windows in place. All rough installations or electrical, plumbing and mechanical systems shall have prior approval by the Agency.

4. **Insulation Inspection.** To be conducted after the installation of the insulation is completed.

5. **Air Infiltration Barrier Inspection**. To be conducted after the air infiltration barrier system is in place and complete.

6. **Gypsum Board or Lath and Plaster Inspection**. To be conducted after all gypsum board or lath, interior and exterior, is in place but before gypsum board joints and fasteners are taped and finished or before plastering is applied.

   Exception:

   The attachment and taping of gypsum board to partition walls that are not part of a fire-resistance rated assembly or a shear wall assembly for construction in occupancies A, B, E, F, M, U and S.

7. **Final Inspection**. To be conducted after construction is completed (all sub-permits must have final approval and sign-off) and the building or space is ready for occupancy.

157.6 Other Inspections. The engineer or architect responsible for the structural design work shall include in the construction documents the following:

1. Special inspections required by Section 158.
2. Other structural inspections required by the engineer or architect in responsible charge of the structural design work.

In addition to the inspections specified, the Building Official may make or require other inspections of any construction work to ascertain compliance with the provisions of this Code and other laws, which are enforced by the Agency. Other inspections, outside of business hours, requested by the owner, design professional or contractor shall be requested no later than 12 noon of the day the inspection is needed. See Table No. 152.1 for fees.

157.7 Reinspections. A reinspection fee may be assessed for each inspection or reinspection when the inspected work is not complete or when corrections called for have not been made. This Subsection is not to be interpreted as requiring reinspection fees the first time a job is rejected for failure to comply with the requirements of this Code, but as controlling the practice of calling for inspections before the job is ready for inspection or reinspection. Reinspection fees may be assessed for failure to properly post the permit card on the work site, for failure to have approved plans readily available to the inspector, for failure to provide access on the date for which inspection is requested, or for deviating from plans requiring the approval of the Agency. To obtain a reinspection, the applicant shall file an application therefore in writing upon a form furnished for that purpose and pay the reinspection fee of a minimum of one hour in accordance with Table No. 152.1. Where reinspection fees have been assessed, no additional inspection of the work will be performed until the required fees have been paid.

157.8 Boilers, Incinerators, Crematories and Pressure Vessel Annual Inspection.

Annual boiler inspections will be made by the State of Colorado.

157.9 Vertical and Horizontal Transportation Annual Inspection. The following units shall be inspected by the Agency and City-Licensed Elevator Contractors: passenger or passenger service elevators, combination passenger and freight elevators, freight and freight service elevators, escalators, moving walks, dumbwaiters, sidewalk elevators, stage lifts, orchestra lifts and manlifts.

A. Required Inspections. The owner, agent or lessee shall, at his expense, cause the elevator to be thoroughly inspected by an Elevator Contractor licensed by the City.

B. Certificate of Inspection. If, after inspection by the Agency, the equipment is found to be in safe condition, the Agency shall issue a certificate of inspection stating that the equipment is ready for use and indicating the maximum load permitted. Certificates of inspection shall be maintained in the building for which they are issued, by the owner, agent or lessee in a manner easily accessible for checking by the Agency or other interested persons. Valid elevator certificates of inspection shall be mounted in a tamper-proof frame in the elevator for

which they were issued or a metal plaque indicating where the certificate of inspection is located within the building may be mounted in the car in lieu of the current certificate of inspection.

C. Equipment Tag. The owner or operating agent shall cause the equipment to be tagged with an appropriate metal tag so as to indicate the contractor's name, date, type of test and work performed. Multiple test dates shall be prohibited.

D. The annual inspection fee for vertical transportation units shall be as specified in Table No. 157.9.

E. Inspections required by ASME A17.1 to be performed every six (6) months shall be changed to ANNUAL (12 month) inspections.

TABLE NO. 157.9
ANNUAL INSPECTION FEES
(VERTICAL TRANSPORTATION)

TYPE OF INSPECTION	FEE
Elevators	$150.00 (each Unit)
For each additional landing over 3	10.00
Escalators *	300.00 (each Unit)
Moving Walks**	300.00 (each Unit)
Dumbwaiters	150.00 (each Unit)
Stage Lifts	150.00 (each Unit)
Orchestra Lifts	150.00 (each Unit)
Man Lifts	150.00 (each Unit)
Platform Lifts	150.00 (each Unit)

* This shall mean each unit, floor to floor, in either direction.
** This shall mean each unit, in either direction.

Inspections outside of normal business hours shall be charged per Table No. 152.1 in addition to the fees of Table No. 157.9.

SECTION 158
SPECIAL INSPECTIONS

158.1 See Section 1704, IBC – Special Inspections

158.2 Structural Observation. When required by the Agency, the owner shall employ an engineer to make visits to the site to observe general compliance with the approved structural plans specifications and change orders. The engineer shall submit a final report in writing to the Agency stating that site visits have been made and that any deficiencies noted have been corrected. Reference IBC Section 1709 – Structural Observations.

SECTION 159
FINAL INSPECTION APPROVAL/CERTIFICATE OF COMPLIANCE

A final inspection approval card will be issued by the Agency upon the completion and approval of the work covered by the permit. A certificate of compliance will be issued by the Agency, when a Certificate of Occupancy is not required, upon the request of the General Building Contractor when the inspection card issued by the Agency is returned indicating that all final inspections by the Agency have been made. There shall be a processing fee of $5.00 for each certificate issued.

SECTION 160
CERTIFICATE OF OCCUPANCY

160.1 Required. All new buildings or structures except miscellaneous buildings or structures shall not be used or occupied until a Certificate of Occupancy is issued by the Agency. No building or portion thereof shall be used or occupied for an occupancy other than the one designated on the certificate until a new Certificate of Occupancy is issued by the Agency. Issuance of a Certificate of Occupancy shall not be construed as an approval of a violation of the provisions of this code or of other ordinances of the City and County of Denver.

160.2 Requirements Prior to Issuance. A Certificate of Occupancy shall be issued to the owner after approval by the Agency and the following:

1. Construction Engineers Division, Wastewater Management and Zoning Administration.
2. Public Health Inspection Division and the Fire Department when specifically requested by either department in writing at the time of application.
3. Public Health Inspection Division, Fire Department and the Department of Public Works showing compliance with all provisions of this Building Code applicable to buildings or structures located in a Special Construction Zone designated pursuant to Article 647 of the Revised Municipal Code.

160.3 Issuance of Certificate. When all the conditions of this Chapter have been fulfilled, the Agency shall issue a Certificate of Occupancy indicating:

1. The use and occupancy for which the certificate is issued.
2. Approval by the Agency.

160.4 Duplicate Certificate of Occupancy. Upon payment of $5.00 to the Agency, a duplicate Certificate of Occupancy may be secured by the owner, architect, engineer, contractor, permit holder or tenant.

160.5 Temporary Certificate of Occupancy. The Agency may issue a temporary Certificate of Occupancy to the owner where unusual construction difficulties have delayed the completion of the construction work covered by the Building Permit. The certificate may be issued provided that no substantial hazard will result from the occupancy and subject to the following items being provided to the Agency:

1. A written request by the owner or the owner's agent, itemizing the uncompleted work and justifying the T.C.O. This list shall not waive, reduce or diminish any Code requirements required by the Building Permit.
2. The process fee shall be $200.00 unless approved by the Building Official.
3. Approval from the following City Agencies:
   A. Construction Engineering Division.
   B. Wastewater Management Division.
   C. Environmental Health Inspection Division.
   D. Fire Department.
   E. Zoning Permitting & Inspection.

This temporary Certificate of Occupancy may be granted for a period up to 12 months. The temporary Certificate of Occupancy may be extended with the approval of the Building Official. After the expiration date of the temporary Certificate of Occupancy, the building or structure shall require a permanent Certificate of Occupancy in accordance with other provisions of this Chapter.

Additional inspections required for the T.C.O. shall be charged as indicated in Table No. 152.1 and shall be paid before the permanent Certificate of Occupancy is issued.

160.6 Change of Use or Occupancy. Changes in the character or occupancy of all buildings or structures shall not be made except as specified in Chapter 34, IBC. A new Certificate of Occupancy is required for all such changes.

160.7 Cancellation of Certificate of Occupancy. A Certificate of Occupancy may be canceled when:

1. Whenever the Certificate is issued in error or on the basis of incorrect information supplied.
2. The owner has failed to comply with the requirements of the Agency after appropriate notice and reasonable time to correct.
3. The continued occupancy of the structure is dangerous to the public health, safety or welfare.

160.8 Right to Appeal. The Board of Appeals may review any appeal of the Agency's suspension or denial of Certificate of Occupancy under Section 113. One extension of a temporary Certificate of Occupancy may be sought from the Board of Appeals subject to Section 113.

SECTION 161
ADDRESS

161.1 On Job Site. The construction permit holder shall post, at the front of the job site in a conspicuous place, a sign indicating the following:

1. The address number and street, avenue, court, parkway or other, as assigned by the Office of the City Engineer.
2. The name of the firm, address, business phone number and emergency phone number of the permit holder.
3. The building permit number.

161.2 Permanent Address. The owner or occupant of every building shall display the permanent address of each building in a permanent visible location with numbers made of durable materials and of a size to be visible and legible from the street fronting the property

SECTION 162
PERMITS FOR TEMPORARY BUILDINGS

162.1 Permit Issuance. A permit for a temporary building may be issued by the Agency if the applicant can substantiate a definite need for the temporary building. The permit may be granted for a period up to 36 months and may be renewed upon reapplication and approval by the Agency. The request for a permit shall be in writing, detailing the reason for the request. The approval shall be based on the need, extent of time, use and/or type of unit installed. A renewal permit fee equal to the original permit fee will be required.

Exception:

Temporary buildings for use by licensed contractors at the construction or demolition sites shall not require a Building Permit.

162.2 Right of Appeal. An extension of a permit for a temporary building may be sought from the Board of Appeals subject to Section 113.

162.3 Fee. A building permit fee shall be established by Table No. 152.1 for the valuation of the temporary building installation which shall consist of (1) the rental cost or the prorated cost of the temporary buildings based on a ten-year life, for the period of the permit, and (2) the cost of the installation and removal of the temporary building

SECTION 163
FOUNDATION PERMITS

163.1 General. A foundation permit for all buildings and structures except one- and two-unit dwellings and miscellaneous structures may be issued to a contractor who holds a license qualifying him as a general contractor for the entire project, prior to the issuance of the construction permit for the building, provided that:

1. The total valuation of the project, excluding utilities, exceeds $200,000 or as approved by the Agency.
2. Drawings of the proposed superstructure containing sufficient detail relating to the design of the foundation or substructure are submitted to the Agency. Structural calculations shall be submitted to validate the gravity and lateral load design of footings, caissons and all other foundation permit elements.
3. Approvals required by the appropriate City agencies are obtained prior to issuance of the permit.
4. For purposes of the Section, the term “Project” shall mean one building only with a valuation in conformance with subsection 152.1.

163.2 Fee. The plan review fee and the permit fee charged at the time of issuance of the foundation permit shall be based on the total valuation of the construction for both the substructure and the superstructure, plus an additional 25%. See Table No. 152.1.

163.3 Deviations. Any deviation from the approval foundation permit drawings shall be cause for the cancellation of the permit. However, if changes are substantiated by engineering calculations and revised drawings, the deviations may be approved by the Agency.

163.4 Responsibility. The contractor shall assume full responsibility for the installation of all utilities in the substructure. Any changes in design or construction to meet the requirements of this Code for the combined substructure shall be the sole responsibility of the contractor. A permit issued under this Section shall not be construed as approval for any portion of the structure not covered by the foundation permit.

163.5 Not Applicable. Foundation permits are not applicable to phased construction.

SECTION 164
PHASED CONSTRUCTION PERMITS

164.1 General. The Department may issue permits for the construction of a portion or phase of a building, structure or utility prior to the submission of the complete drawings and specifications, provided that:

1. The minimum total valuation of the building, structure or utility is more than $1,000,000.
2. Prior to the submitting the first phase of the project the applicant submits a Phased Construction Proposal (the "Proposal") to the Agency outlining the schedule for the phased construction. The Proposal must provide a title for, and describe the building system(s) to be reviewed in each of the phased submittal packages. The proposal shall state the valuation for each phase and should contain an estimated submittal date for each of the phases.
3. The valuation of the portion of the work, including utilities, is restated with each phased application.
4. Drawings for each phase shall, on each sheet, include the title for the phase chosen in the Proposal and the term "Phased Construction".
5. The approval of appropriate City agencies has been obtained prior to issuing such phased permit.

164.2 Fees. Plan review fees and permit fees for the initial phases shall be assessed at 150% the amount of those specified in Table No. 152.1. Plan review fees and permit fees for the final phase shall be assessed at 100% the amount of those specified in Table No. 152.1. The total plan review fee shall not be less than that based upon the total valuation of the construction for all phases of the project plus an additional 25%. A permit issued under this Section shall not be construed as approval for any portion of the structure not covered by the permit.

SECTION 165
TABLES AND FEES

165.1 Permit Fees. The fee specified in Table No. 152.1 shall be assessed for all permits except as otherwise provided for in this Chapter.

165.2 Other Fees. Annual and semiannual fees shall be as specified in Table No. 157.8 and Table No. 157.9. Inspections outside of normal business hours shall be charged in accordance with Table No. 152.1.

AMENDMENTS TO THE 2006 EDITION OF THE INTERNATIONAL BUILDING CODE

AND APPENDICES AS PUBLISHED BY INTERNATIONAL CODE COUNCIL (ICC)

The content of the sections in this Code that begin with a letter or letters designations are maintained by other City or State entities.

[F]	**Denotes Fire**
[PW]	**Public Works**
[EB]	**Existing Building**
[CDH]	**Colorado Division of Housing**
[IFCA]	**International Fire Code Amendments**
[Z]	**Zoning**

CHAPTER 1
ADMINISTRATION

SECTION 101
GENERAL

Section 101.1 Title is amended by inserting "City and County of Denver" for the name of the jurisdiction.

Section 101.4.1 Electrical is amended by deleting this section in its entirety.

Section 101.4.5 Property Maintenance is amended by deleting this section in its entirety.

Sections 103 through 115 are amended by deleting these sections in their entirety. The Administration of the Denver Building Code shall govern.

CHAPTER 2
DEFINITIONS AND ABBREVIATIONS

SECTION 201
GENERAL

Section 201 is amended by replacing Section 201.4 in its entirety with the following:

201.4 General. For purposes of this Building Code, certain words, phrases and terms shall be given the defined meaning. Words, phrases and terms not defined in this Code shall be given their usual and customary meanings. Webster's Third New International Dictionary of the English Language, Unabridged, shall be considered as providing ordinarily accepted meanings. The word "shall" is mandatory and not permissive; the word "may" is permissive and not mandatory. Other terms and abbreviations used only with specialized application are defined in the Chapter in which they are used. Definitions are amended or added, and where conflicts occur these definitions shall govern.

SECTION 202
DEFINITIONS

Section 202 is amended by adding the following definitions:

ABANDON. The desertion of a building, structure or utility. Abandon shall also apply when the building, structure or utility is left to the effects of vandalism, dilapidation and deterioration, thereby creating a fire hazard, unsafe condition or public nuisance.

ADEQUATE. Determined to be acceptable to the Agency.

ADMINISTRATIVE AUTHORITY. The Building Official.

ADULT DAY CARE. Adult day care is a program designed to meet the needs of adults with functional impairments through an individual plan of care. It is a structured, comprehensive program that provides a variety of health, social and related support services by persons who are not their relatives or legal guardians, in a protective setting during any part of a day but less than 24 hours. See Section 308.5.1 (Occupancy I-4).

ADULT DAY CARE CENTER. Adult day care center is any building or portion thereof that provides an adult day care program for 5 or more clients over the age of 16 years. See Section 308.5.1 (Occupancy I-4).

ADULT DAY CARE HOME. A private residence in a single-unit dwelling or a dwelling unit in a multiple-unit dwelling providing less than 24 hours a day care for four 4 or fewer clients over the age of 16 years. See Section 310.1 (Occupancy R-3).

AMBULATORY. A physical or mental condition under which a person is capable of judgment and appropriate action for self-preservation under emergency conditions.

ARCHITECT. An architect licensed by the State of Colorado.

ASSISTED CARE FACILITIES. See Personal Care Facilities. See Section 308.2 (Occupancy I-1) and Section 310.1 (Occupancies R-3 and R-4).

BOARD. The Board of Appeals.

CHILD CARE CENTER. A facility which provides a comprehensive care service for the child when the parent or guardian is employed or otherwise engaged and unavailable to care for the child. The facility is maintained for the whole or part of a day but for less than 24-hour care of 5 or more children from the ages of 6 weeks through 16 years, and not related to the owner, operator or manager thereof, whether such facility is operated with or without compensation for such care, and with or without compensation for stated educational purposes. The term includes facilities commonly known as a "day care center," "day nurseries," "nursery school," "kindergarten," "preschool," "play groups," "school age programs," "centers for the developmentally disabled children," "day treatment centers," "extended day programs" and "summer playground programs." See Sections 305.2 (Occupancy E), 308.3.1 (Occupancy I-2) and 308.5.2 (Occupancy I-4).

Child Care Centers shall not include:

1. Child Care Homes
2. The Pre-kindergarten and Kindergarten programs which are maintained in connection with a public, private or parochial school system of at least 6 grades, providing an educational program for the 2 years preceding entrance to the first grade.

CHILD CARE HOME. A child care home shall be classified as an R Occupancy, Division 2 or 3. A private residence in a single-unit dwelling or a dwelling unit in a multiple-unit dwelling providing care and education for periods of less than 24 hours a day for 12 or fewer children under the age of 17.

CONSTRUCTION. The act of using labor and materials used for erection, demolition or removal of a building, structure, utility, appliance or device.

DEMOLITION. The destruction and removal of a building, structure or utility.

DETERIORATION. The effect upon buildings, structures, utilities, equipment and materials through corrosion, decay, wear and tear due to use or abuse, obsolescence, effects of the elements, fire damage, disaster, flood, earthquake, lack of maintenance, vandalism or any other cause, including fatigue due to overstressing and disintegration of component parts and the separation of materials and structural parts.

ENGINEER. An Engineer registered by the State of Colorado as a Professional Engineer.

EVACUATION CAPABILITY. The ability of the occupants, residents and staff as a group either to evacuate a building or to relocate from the point of occupancy to a point of safety. Following are the levels of evacuation capability:

1. *Prompt.* Evacuation capability equivalent to the capability of the general population to evacuate a facility. Evacuation drill time shall be 3 minutes or less.
2. *Slow.* Evacuation capability of a group to move to a point of safety in a timely manner, with some of the residents requiring assistance from the staff. Evacuation drill time shall be over 3 minutes, but not in excess of 13 minutes.
3. *Impractical.* A group that, even with staff assistance, cannot reliably move to a point of safety in a timely manner. Evacuation drill time is more than 13 minutes.

FIRE DEPARTMENT. The Fire Department of the City and County of Denver.

HOME OCCUPATION. Limited commercial use of a portion of a dwelling unit, single unit dwelling or multiple unit dwelling as permitted by the Department of Zoning Administration in accordance with Revised Municipal Code Section 58-89. "Home occupations allowed".

INDEPENDENT LIVING. The ability of a resident to provide for and maintain the basic functions of everyday living and to recognize and respond to an emergency for self-preservation.

[IFCA] LOWEST LEVEL OF FIRE DEPARTMENT VEHICLE ACCESS. The lowest level of Fire Department vehicle access shall be measured from the lowest elevation of any required Fire Department access road located no more than 30 ft. from any exterior wall of the building.

Exceptions:

1. Where the access road is permitted to be farther than 30 ft. to any exterior wall of the building, the lowest level of Fire Department vehicle access shall be measured from the lowest elevation of any required Fire Department access road located no more than 50 ft. from any exterior wall of the building.
2. If any topography, waterway, non-negotiable grades or other similar conditions exist that preclude required Fire Department vehicular access, the Fire Code official is authorized to require additional fire protection systems as required by Chapter 9.

MAINTENANCE. The normal upkeep of property or equipment to keep it in an existing state, such as minor repairs to keep equipment operational. This definition shall not invalidate the requirement for a permit when so determined by the Agency as beyond the scope of maintenance.

NONAMBULATORY. A physical or mental condition under which a person is not capable of judgment and appropriate action for self-preservation under emergency conditions.

NURSING HOME. A facility that is operating in connection with a hospital or where nursing care and medical services are prescribed by or performed under the general direction or persons licensed to practice medicine or surgery by the State of Colorado or for the accommodation of convalescents or other persons who are not actually ill and not in need of hospital care and related services. The term "nursing home" is restricted to facilities designed to provide skilled nursing care and related medical services for a period of not less than 24 hours per day.

OCCUPIED ROOF. The roof of a building or structure used for purposes other than maintenance, repair or servicing of the building equipment.

PERSONAL CARE. Protective care of residents who do not require chronic or convalescent medical or nursing care. Personal care involves responsibility for the safety of the resident while inside the building. Personal care may include daily awareness by the management of the resident's functioning and whereabouts, making and reminding a resident of appointments, the ability and readiness for intervention in the event of a resident experiencing a crisis, supervision in the areas of nutrition and medication, and actual provision of transient medical care.

PERSONAL CARE FACILITY. See Personal Care Service, Section 310.2.

PUBLIC UTILITY. An authorized or franchised firm given the right to perform services necessary under the authorization or franchise.

RECOGNIZED VOLUNTEER ORGANIZATION. A nonprofit organization, recognized by the Internal Revenue Service as a charitable or religious organization.

SCHOOL: PUBLIC, PRIVATE OR CHARTER. An institution which provides instruction or education at elementary, secondary and high school learning levels.

SMOKE CONTROL SYSTEM. An engineered mechanical and electrical system designed to provide a tenable environment for the evacuation or relocation of occupants and control the development and movement of smoke.

STRUCTURE. An assembly of materials forming a construction for a specific use including, among others, buildings, stadiums, tents, reviewing stands, platforms, stagings, observation towers, radio and television towers, water tanks, swimming and wading pools, retaining walls, open sheds, coal bins, shelters, fences and display signs. This definition shall not include utilities.

TENANT. A person occupying a building or portion thereof and separated from other tenants by walls, floors and ceilings. The tenant shall have a lease to occupy the specified space from the owner.

USABLE SPACE. Space that may be used. This definition does not apply when usable or potential usable space is sealed off so that access to the area is not provided.

UTILITIES. For the purpose of this Code, utilities shall be defined, without limitation to include the following:

Refrigeration systems and their appurtenances; electrical systems and all appurtenances, such as motors, etc.; heating and ventilation systems and appurtenances; elevators, dumbwaiters, escalators and similar conveyances; fire

protection systems and apparatus; air conditioning or air treatment systems, including ductwork; exhaust or ventilating systems, including ductwork; plumbing and sanitary systems and all appurtenances; signal and annunciator systems; gas, oil and solid fuel-fired appliances, piping, controls, burners and their appurtenances; evaporative cooling, antennae, wells and equipment; water heaters; gas lights; swimming pool piping; gasoline pumps; and L.P.G. liquid fuel and gasoline tanks and piping.

VALUE OR VALUATION. The building replacement value for permit purposes including labor, profit, overhead, materials, base building equipment and appliances.

The determination of value or valuation shall be made or directed to be made by the Agency.

WORK. All construction or repair excluding decoration or maintenance of existing utilities or appliances.

WRECKING. See Demolition.

CHAPTER 3
USE AND OCCUPANCY CLASSIFICATION

SECTION 303
ASSEMBLY GROUP A

Section 303.2 is added:

303.2 Fire Command Room In Group A Occupancies With An Occupant Load Of 1000 Or More. A fire command room complying with IFCA Section 503 shall be provided in a location approved by the fire department.

SECTION 305
EDUCATIONAL GROUP E

Section 305.3 is added:

305.3 Conversion of Existing Buildings to Small Day Care Centers. An existing building may be converted to a small day care center without complying with all the requirements for a change of use under Section 305, provided the following provisions are met:

Drawings and specifications need not bear the seal of an architect or engineer. However, after the review of the drawings and specifications, the Agency may require that the drawings and specifications bear the seal of an architect and engineer who will be responsible for the design phases of the conversion.

Any building additions or new facilities installed or erected, as part of the conversion shall comply with present Building Code provisions.

The number of occupants, excluding staff, shall not exceed 20 and shall be permitted on the first story only.

Exceptions:

1. Basements having floor levels located within 4 feet (1219 mm), measured vertically, from adjacent ground level at the level of exit discharge, provided the basement has exterior exit doors at that level.
2. Any floor level with an exterior door leading directly to the outside where the floor level is within:
   a. Two feet vertically of directly surrounding grade shall be allowed for children 2 ½ years or younger.
   b. Five feet vertically of directly surrounding grade shall be allowed for children more than 2 ½ and less than 5 years of age.
   c. Eight feet vertically of directly surrounding grade shall be allowed for children over 5 years of age and ambulatory adults.
3. Egress from the floor level to grade may be by stairs or ramps.

4. A floor level occupied for day care activities shall have 2 exits. Two exits may include one exit directly to grade or as provided in item #3 above with a second exit as an interior stair or ramp. Egress through a window shall not be accepted as an exit.
5. There shall be no dead-end corridors.
6. Gas-fired heating appliances must comply with the International Mechanical Code.
7. Existing partitions, walls and ceilings may be approved if the existing surface is of a fire-resistive material consisting of lath and plaster or gypsum board of at least ½ inch thickness.
8. Section 907.2.3 shall apply to all conversions. Residential type multiple single-station smoke detectors may be installed with field inspector approval. System type smoke detectors will require drawings signed and sealed by an electrical engineer.
9. Requirements of other City and State agencies must be complied with. When a conflict occurs between regulations of different agencies, the most restrictive will govern.

SECTION 308
INSTITUTIONAL GROUP I

Sections 308.5.3 is added:

Section 308.5.3 Conversion of Existing Buildings to Small Day Care Centers. See Section 305.3.

SECTION 310
RESIDENTIAL GROUP R

Section 310.1 R-2 Residential Occupancies has been amended by adding "Live/Work" units to the list of occupancies.

310.3 Special Provisions for Residential Personal Care Facility. A Personal Care Facility may occupy Group I-1, Group R-3, or Group R-4 occupancies with the following provisions:

1. Type of Occupancies
   A. Group R-3 Home Occupancy: less than 3 occupants
   B. Group R-3 Personal Care Facility: from 3-5 occupants

      Group R-4 Personal Care Facility: from 6 to 16 occupants

      Group I-1 Personal Care Facility: more than 16 occupants

   Note: Above occupant load does not include the care provider.
2. Plans and permit shall indicate the maximum occupant load and for Personal Care Facilities indicate the evacuation capability classification.
3. Plans for the renovation of an existing building or the construction of a new building shall bear the seal and signature of the Architect or Engineer responsible for the design phases of the building. See Section 153.
4. Personal Care Facility Provider shall:
   A. Develop a Facility Personal Care Plan, which specifically establishes the services to be provided to the residents (forms provided by the Agency).
   B. Establish an Evacuation Capability by using the "Facility and Resident Characteristics for Establishing Evacuation Capability" chart. The actual evacuation capability will be verified by the Fire Department after the building is occupied.

SECTION 312
UTILITY AND MISCELLANEOUS GROUP U

Section 312.2 is added:

312.2 Fences and Retaining Walls.

312.2.1 General. This Section shall apply to all fences or walls in excess of 4 feet in height, all retaining walls in excess of 3 feet in height. For exempted work refer to Section 150.2, item #2 and #5.

312.2.2 Design. All fences, walls and retaining walls shall be designed in accordance with IBC Section 1806 & 1609.

[F]312.2.3 Prohibition. The following prohibitions shall apply to all fences, walls or retaining walls, regardless of height:

1. The use of barbed wire or any other sharp-pointed material as a fencing material or on top of fences or retaining walls is prohibited per IFCA 507.4.
2. The use of electrically charged fences or on top of fences or retaining walls is prohibited per IFCA 507.4.

CHAPTER 4
SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

SECTION 402
COVERED MALL BUILDINGS

[F] Section 402.14.1 is added:

402.14.1 Fire Command Room In Covered Mall Buildings. A fire command room complying with IFCA Section 509.3 shall be provided in a location approved by the fire department for covered mall buidlings exceeding 50,000 square feet in total floor area.

SECTION 403
HIGH-RISE BUILDINGS

[F] 403.5 Automatic Fire Detection is amended by replacing reference to IFCA.

[F] 403.6 Emergency Voice/Alarm Communication Systems is amended by replacing reference to IFCA.

[F] 403.7 Fire Department Communications System is amended by replacing it in its entirety with the following:

[F] 403.7 Fire Department Communications System. A fire department communication system shall be provided in accordance with IFCA.

[F] 403.10.1 Fuel Supply is amended by adding the following:

[F] 403.10.1. Fuel Supply. An on-premises fuel supply, sufficient for not less than 8 hours full-demand operation of the system, shall be provided.

403.12 Stairway Door Operation is deleted in its entirety and locking of stairway doors are addressed by Appendix L Access Control Systems.

Section 403.15 Accessible Means Of Egress And Area Of Refuge Required is added to include the following:

403.15 Accessible Means Of Egress And Area Of Refuge Required. Accessible means of egress shall comply with this section. Only one accessible means of egress is required in high-rise buildings possessing hoist way pressurization conforming to the provisions of IBCA Section 909.21.4.2.

Section 403.15.1 Group A, B, E and M Occupancies. In Group A, B, E and M occupancies, an elevator complying with Section 1007.4 and an area of refuge/elevator lobby providing direct access to the elevator shall serve as the accessible means of egress. The area of refuge shall be sized in accordance with Section 1007.6.1. Each area of refuge shall be separated from the remainder of the story by a smoke barrier complying with Section 709.

Section 403.15.2 Group R1, R2 and I1 Occupancies. In Group R1, R2, and I1 occupancies, an elevator complying with Section 1007.4, with a fire-resistive corridor providing direct access to the elevator from all dwelling units or sleeping units shall serve as the only required accessible means of egress. An enclosed elevator lobby is not required.

403.16 Area of Refuge/Elevator Lobby Pressurization. The area of refuge/elevator lobby shall be pressurized by the transfer of air from the pressurized hoist way through the leakage at the elevator doors.

SECTION 405
UNDERGROUND BUILDINGS

Section 405.1 is amended by the addition of Exception 6.

Exception:

6. High Rise buildings shall comply with Section 403.

SECTION 406
MOTOR-VEHICLE-RELATED OCCUPANCIES

[PW] 406.2.10 is added:

406.2.10 Motor Vehicle Exiting from Parking Facilities. Where ramps are provided for motor vehicles to exit from a parking facility or from a private drive onto the public right of way, the ramps shall be sloped at 0.5% minimum to 2% maximum for a distance at least 20 feet inside of the building or property line. Vertical curves shall be used at all grade breaks.

Exception:

When alternate slopes are approved by the "Transportation, Engineering and Planning Division" of Public Works.

SECTION 411
SPECIAL AMUSEMENT BUILDINGS

[F] Section 411.6.1 Fire Command Room for Special Amusement Buildings is added.

411.6.1 Fire Command Room for Special Amusement Buildings. A fire command room complying with IFCA 509.4 shall be provided in a location approved by the Fire Department.

SECTION 421
LIVE/WORK UNITS

Section 421 Live/Work Units has been added.

421.1 General. A live/work unit is a dwelling unit or sleeping unit in which a significant portion of the space includes a non-residential use, which is operated, by the dwelling unit or sleeping unit occupant and shall comply with Section 421.

Exception:

Dwelling units or sleeping units which conform to the provisions of Section 59-89 of the Revised Municipal Code for the City and County of Denver shall be classified as a Home Occupancy, not a live/work unit.

421.1.1 Limitations. The following shall apply to all live/work areas:

1. The live/work unit is permitted to be a maximum of 3,000 square feet.

2. The non-residential area is permitted to be a maximum of 50% of the area of each live/work unit; such area shall be further limited to maximum occupant load of 49 persons, as determined by dividing the floor area under consideration by the occupant-per-unit-area factor assigned to the occupancy set forth in Table 1004.1.1.
3. The non-residential area function shall be limited to the first or main floor only of the live/work unit.
4. Aggregate amount of flammable and combustible liquids within each live/work unit shall not exceed 10 gallons. All flammable and combustible liquids shall be stored in liquid storage cabinets in accordance with IFC Section 3404.3.2, the amount in use shall not exceed 1 gallon.
5. Aggregate amount of flammable gas including LPG within each live/work unit shall not exceed 1-one pound cylinder in use with 1-one pound cylinder in storage.
6. Outside storage of any flammable and combustible liquids and flammable gases is prohibited.

421.2 Occupancies. Live/work units shall be classified as a Group R-2 occupancy. Separation requirements found in Section 508.3 shall not apply within the live/unit when it is in compliance with Section 421. Commercial activities shall be limited to the following:

Group B occupancies

Group M occupancies, except motor fuel-dispensing facilities

Group F occupancy custom manufacturing establishments primarily engaged in the on-site production of goods by hand manufacturing which involve only the use of hand tools or mechanical equipment not exceeding two (2) horsepower per piece of equipment not to exceed a total of six horsepower; or a single kiln not exceeding eight (8) kilowatts or the equivalent in a gas fired fixture.

Spray finishing operations shall be limited to those allowed by International Fire Code Section 1504.9.

The aggregate of area of non-residential storage in the live/work unit shall be limited to 10% of the space dedicated to non-residential activities.

421.3 Fire-resistance-rated construction. The fire-resistance rating required by Sections 708 and 711.3 between units shall be a minimum of 1-hour construction.

421.4 Vertical openings. Floor opening between floor levels of a live/work unit is permitted without enclosure.

421.5 Fire protection. The live/work unit shall be provided with a fire sprinkler system designed and installed in accordance with Section 903.3.1.1 or 903.3.1.2, as applicable, throughout the building.

An approved automatic fire detection system shall be installed in accordance with the provisions of this code and NFPA72 throughout the non-residential area. Fire alarm system shall be monitored by Class 1 Central Station per IFC 907. Residential portions shall be equipped single-or multiple-station smoke alarms shall be installed in all of the following locations:

1. In sleeping areas
2. In every room in the path of the means of egress from the sleeping area to the door leading from the sleeping unit.
3. In each story within the sleeping unit, including basements. For sleeping units with split-levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.
4. Power source shall be in accordance to IFC 907.2.10.2.
5. Interconnection of smoke detectors shall be in accordance to IFC 907.2.10.3

   Notification appliances shall be installed throughout the live/work area in accordance with the provisions of this code and NFPA72 throughout.

   Devices, combinations of devices, appliances and equipment shall comply with Section 907.1.2.

421.6 Means of egress. Except as modified by this section, the provisions for Group R-2 occupancies in Chapter 10 shall apply to the entire live/work unit.

421.6.1 Means of egress doors serving the non-residential function area shall provide a floor or landing on each side of the door. Such floor or landing shall be at the same elevation on each side of the door.

421.6.2 Emergency escape and rescue openings shall be provided in the residential area in accordance with the provisions Section 1026. Section 1036.1, Exception No. 1 is not applicable to live/work units.

421.7 Accessibility. The applicable requirements of Chapter 11 shall apply to each area within the live/work unit.

421.8 Ventilation. The applicable requirements of the amended International Mechanical Code shall apply to each area within the live/work unit for the function within that space.

421.9 Structural. Floor loading for the areas within a live/work unit shall be designed to conform to Table 1607.1 based on the function within the space.

421.10 Electrical. The applicable requirements of Chapter 27 shall apply to each area within the live/work unit 421.11 Plumbing. The applicable requirements of the amended International Plumbing Code shall apply to each area within the live/work unit for the function within that space. The non-residential use portion of the live/work unit is not considered to be a Group R occupancy for the purpose of applying the provisions of amended IBC Section 2902.9.

CHAPTER 5
GENERAL BUILDING HEIGHTS AND AREAS

SECTION 507
UNLIMITED AREA BUILDINGS

Section 507.12 is added:

[EB] 507.12 Existing Buildings. Any building constructed prior to March 26, 1994 and meeting the requirements of one of the categories in Table 507.12 is allowed to retain its existing area, provided the existing area does not exceed the allowable area of the code under which it was last certified for occupancy, including all applicable Modifications Under Special Circumstances and retrofit ordinances. Building additions shall satisfy the current code and Table 507.12.

TABLE 507.12
EXISTING BUILDING UNLIMITED AREA ADDITIONS

Category	Occupancy Group	Maximum No. of Stories	Type of Construction	Auto Sprinkler Throughout	Minimum Open Space*
1	B, F, M, S	1	ALL	YES	20’
2	F2, S-2	1	II, III-A	NR	40’
NOTE:	NR = NOT REQUIRED * = ENTIRELY SURROUNDED AND ADJOINED BY PUBLIC WAYS OR YARDS NOT LESS THAN DISTANCE INDICATED. ADDITIONAL OPEN SPACE MAY BE REQUIRED FOR FIRE DEPARTMENT ACCESS, SEE *FIRE CODE.*				

SECTION 508
MIXED USE AND OCCUPANCIES

Section 508.3.1 Accessory Occupancies has been amended by adding Exception 4.

Exception:

1. Live/work units in accordance with Section IBCA 421 are not considered separate occupancies.

CHAPTER 7
FIRE-RESISTANCE-RATED CONSTRUCTION

SECTION 704
EXTERIOR WALLS

Section 704.2 Projections is amended in its entirety.

704.2 Projections. Cornices, eave overhangs, exterior balconies and similar cantilevered or wall hung projections extending beyond the floor area shall conform to the requirements of this section and Section 1406. Exterior egress balconies and exterior exit stairways shall also comply with Sections 1014.5 and 1023.1, respectively. The distance from exterior edges of projections to the closest interior lot line or to an imaginary line between two buildings on the property shall not be less than four feet (1220 mm).

704.2.1 Type I and II construction. Projections from walls of Type I or II construction shall be of noncombustible materials or combustible materials as allowed by Sections 1406.3 and 1406.4.

704.2.2 Type III, IV or V construction. Projections from walls of Type III, IV or V construction shall be of any approved material.

704.2.3 Combustible projections. Combustible projections located where the distance from the exterior edges of projection to the closest interior lot line or to an imaginary line between two buildings on the property is less than 6 feet (1830 mm) shall be of at least 1-hour fire-resistance-rated construction, Type IV construction, fire-retardant-treated wood or as required by Section 1406.3.

Exceptions:

Type V construction shall be allowed for R-3 occupancies.

In buildings required by this Section to have fire resistance rated roof assemblies, vent openings in the bottom membrane of fire-resistance rated roof overhangs are permitted when buildings are protected by an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.

704.2.4 Noncombustible projections. Noncombustible projections shall not be required to have a fire-resistance-rating.

Section 704.8 Allowable Area of Openings.

Section 704.8.1 Automatic Sprinkler System is amended by adding the following sentence to the end of the paragraph.

704.8.1 Automatic Sprinkler System is applicable to openings with or without windows, duct and air transfer openings.

Section 704.12 Opening Protection.

704.12 Opening Protection is amended by replacing the Exception in its entirety with the following:

Exception:

Where opening protection is provided by ceiling sprinkler heads spaced at 6 ft. on center and placed between 6 to 12 inches from the wall, area of exterior openings described in Table 704.8 shall not exceed 50% where the fire separation distance is greater than 5 and is less than 15 ft. Buildings shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. The sprinkler system shall be designed to distribute at least 3 gpm per linear foot of wall opening. The sprinkler system serving the floor shall be designed to provide adequate water supply to either a hydraulically calculated remote floor area in accordance with NFPA 13 or to all of the exposure protection heads on any one level of the building, whichever demand is greater.

Section 704.14 Ducts and transfer openings.

704.14 Ducts and Air Transfer Openings is amended by adding Exception 2.

Exception:

2. The building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

SECTION 707
SHAFT ENCLOSURES

707.2 Shaft Enclosure Required, Exception 2, item 2.1 is amended by replacing the last sentence in its entirety with the following:

For escalator openings this application is limited to openings that do not connect more than four stories for other than Group B and M occupancies. For stairway openings, this application is limited to openings that do not connect more than three stories for buildings without smoke control capabilities. For buildings with smoke control capabilities this application is limited to openings that do not connect more than four stories. The smoke control capabilities shall comply with Section 909. In addition, smoke detectors shall be located adjacent to the floor side of the openings. The smoke control system for the openings shall be subject to field testing.

707.4 Fire Resistance Rating is amended by adding the following Exception:

Exception:

Shaft enclosures for piping, ducts and vents may be of one hour fire-rated construction in buildings of four stories or more and of Construction Types of IIA, IIB, IIIA, VA.

707.5 Continuity is amended by adding the following Exception:

Exception:

Shaft enclosures for piping, ducts and vents in Construction Types of IIB, IIIB and VB may be supported on non fire-rated assemblies.

Section 707.14 Elevator, Dumbwaiter and Other Hoist ways.

707.14.1 Elevator Lobby is amended by replacing Exception 6 with the following:

Exception:

6. Enclosed elevator lobbies are not required in non high-rise buildings where the elevator is pressurized in accordance with IBCA Section 707.14.2.1. Elevator lobbies in highrise buildings shall comply with IBCA Section 403.15 and 403.16.

Section 707.14.2 Enclosed Elevator Lobby Pressurization Alternative is amended by replacing the title of the section with the following:

707.14.2 Enclosed Elevator Lobby Pressurization Alternative For Non-Highrise Building. Where elevator hoistway pressurization is provided in lieu of required enclosed elevator lobbies, the pressurization system shall comply with this section.

Section 707.14.2.1 Pressurization Requirements is amended in its entirety.

707.14.2.1 Pressurization for Non High Rise Buildings. Elevator hoist ways shall be pressurized to maintain a minimum positive pressure of 0.05 inches of water column with respect to the adjacent spaces on all floors with the HVAC system off. The supply air intake shall be from an outside, uncontaminated source located a minimum distance of ten (10) feet from any air exhaust system or outlet.

SECTION 716
DUCTS AND AIR TRANSFER OPENINGS

716.5.3 Shaft Enclosures Exceptions is amended by deleting exception 1.3 and exception 4 to comply with IFCA Section 909.

CHAPTER 9
FIRE PROTECTION SYSTEMS

Other Amendments to this chapter are located in Chapter 9 of the Amendments of the International Fire Code.

Section 909.20 Smokeproof Enclosures

Where required by Section 1020.1.7, a smokeproof vertical exit enclosure shall be constructed in accordance with this section. A smokeproof vertical exit enclosure shall consist of an enclosed interior exit stair that conforms to Section 1020.1 with either a natural ventilated outside balcony or pressurized in accordance with DBC Section 909.21. Where access to the roof is required by the IFC, such access shall be from the smokeproof enclosure where a smokeproof enclosures is required.

Section 909.20.1 is deleted in its entirety.

909.20.2 Construction. Smokeproof vertical exit enclosures shall be separated from the remainder of the the building by not less than a 2-hour fire-resistance-rated fire barrier without openings other than the required means of egress doors. The open exterior balcony shall be constructed in accordance with the fire-resistance-rating requirements for floor construction.

909.20.2.1 Door Closers. Doors in a smokeproof enclosure shall be self closing or shall be automatic – closing by actuation of a smoke detector installed at the floor-side entrance to the smokeproof enclosure. The actuation of the smoke detector on any door shall activate the closing devices on all doors in the smokeproof enclosure at all levels. Smoke detectors shall be installed in accordance with Section 907.10.

909.20.4 Mechanical Ventilation Alternative. This section and its subsections are deleted in their entirety.

909.20.5 Stair Pressurization Alternative. Stairway pressurization shall comply with IFCA Section 909.21.4.

909.20.6 Ventilation Equipment. This section and its subsection are deleted in their entirety.

CHAPTER 10
MEANS OF EGRESS

SECTION 1004
OCCUPANT LOAD

Section 1004.1.1 Areas without fixed seating Exception is amended by replacing the exception:

Exception:

Where approved by the building and fire code officials, the actual number of occupants for whom each occupied space, floor or building is designed, although less than those determined by calculation, shall be permitted to be used in the determination of the design occupant load.

SECTION 1005
EGRESS WIDTH

Amend Table 1005.1 as follows:

TABLE 1005.1
EGRESS WIDTH PER OCCUPANT SERVED

	WITHOUT SPRINKLER SYSTEM		WITH SPRINKLER SYSTEM[a]	
Occupancy	Stairways (inches per occupant)	Other egress components (inches per occupant)	Stairways (inches per occupant)	Other egress components (inches per occupant)
Occupancies other than those listed below	**0.3**	**0.2**	**0.25**	**0.175**
Hazardous: H-1, H-2, H-3 and H-4	**0.7**	**0.4**	**0.3**	**0.3**
Institutional: I-2	**n/a**	**n/a**	**0.3**	**0.2**
Assembly with Occupant Loads Greater than 400	**0.3**	**0.2**	**0.3**	**0.2**

For SI: 1 inch = 25.4 mm
n/a = Not Applicable
a. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.1.2.

SECTION 1007
ACCESSIBLE MEANS OF EGRESS

Section 1007.1 Accessible means of egress required.

1007.1 Accessible means of egress required is amended by adding exception 4.

Exception:

4. Buildings required to comply with Section 403 of the International Building Code shall be provided with accessible means of egress in accordance with IBCA Section 403.15.

Section 1007.6 Area of refuge is amended by moving the reference to horizontal exits and smoke barriers from the last sentence of the first paragraph to one of two exceptions.

1007.6 Area of refuge. Every area of refuge shall be accessible from the space it serves by an accessible means of egress. The maximum travel distance from any accessible space to an area of refuge shall not exceed the travel distance permitted for the occupancy in accordance with Section 1016.1. Every required area of refuge shall have direct access to an enclosed stairway complying with Section 1007.3 and 1020.1 or an elevator complying Section 1007.4. Where an elevator lobby is used as an area of refuge, the shaft and lobby shall comply with IBCA Section 1020.1.7. Areas of refuge for high rise buildings shall comply with Section 403.15 and 403.16.

Exceptions:

1. Elevators in an area of refuge formed by a horizontal exit or smoke barrier.
2. In buildings not required to comply with Section 403 or 405, elevator lobby areas of refuge shall be enclosed by smoke barriers in accordance with IFCA Section 909.5. Openings in the elevator shaft enclosure other than those directly serving an area of refuge, shall be protected from the intrusion of smoke in accordance with IFCA Section 909.5.2. Loss of power to, or the actuation of, any fire detection or suppression device on any level shall cause the closure of all automatic opening protectives in the enclosures of all areas of refuge and the elevator shafts serving them, except the shaft enclosure doors at the floor level designated for recall in accordance with Section 3003.2.

Replace Section 1007.6.3 as follows:

1007.6.3 Two-way communication. A two-way communication means between the area of refuge and an approved location in the building readily accessible to authorized and emergency personnel shall be provided (see IFCA Section 509). The means shall be monitored for integrity and annunciated per NFPA 72 (see 2007 NFPA 72 Section 4.4.7; the two-way communcation means shall not be considered "supplementary").

The two-way communcation means shall comply with the following requirements:

1. The user interface in the area of refuge must be accessible and usable by people with disabilities. Clearance, location, protrusion, labeling, signage and operability of the user interface shall comply with ANSI A117.1
2. A push button to activate the two-way communication means shall be provided in the area of refuge. The button shall be visible and permanently identified as "HELP" on or adjacent to the button.
3. Tactile and Braille operating instructions shall be incorporated with or adjacent to the "HELP" button. When the button is pushed, the emergency two-way communication means shall initiate a call for help at an approved location within the building. A visual indication shall be provided on or adjacent to the "HELP" button, and an audible signal shall be provided to acknowledge successful initiation. The visual indication shall remain activated at least until two-way voice communication is established, and shall be deactivated by the time two-way voice communcation is terminated.
4. The two-way communication means shall not be transmitted to an automated answering system. The call for help shall be answered by authorized personnel. When the approved location is not continuously staffed by authorized personnel who can take appropriate action, the call shall also be directed, automatically, within 30 seconds, to a listed central supervising station where authorized personnel will make an appropriate response, or to 911 if the building does not have a monitored fire alarm system.
5. The two-way communcation means shall automatically provide to authorized personnel an indication that assistance is required, and information that identifies the building location of the actuated user interface.
6. Audible and visual indications which are activated by authorized personnel shall be provided to acknowledge two-way communication has been established. The visual indicator shall be located on or adjacent to the "HELP" button. After the call acknowledgement signals are sent, two-way voice communication shall be established without any intentional delay or required intervention by a person in the area of refuge. The visual indication shall be deactivated only when the two-way voice communication is terminated.
7. The means of two-way communication shall enable emergency personnel within the building to establish two-way voice communication to each refuge area individually. The means shall override communication outside the building. Once established, two-way voice communication with emergency personnel shall be discontinued only when emergency personnel terminate the call.
8. The two-way communication means shall be connected to a source of, or automatically transferred to an alternate (standby, emergency, etc.) source of power capable of providing for the visual and audible indicators in the area of refuge, and the means of voice communication for at least four hours when the normal power supply fails.

SECTION 1008
DOORS GATES AND TURNSTILES

Section 1008.1.3.4 is Access-controlled egress doors. Access-controlled egress doors are addressed by Appendix L, Access Control Systems.

Section 1008.1.8.6 Delayed egress locks is deleted in its entirety and are addressed by Appendix L, Access Control Systems.

Section 1008.1.8.7 Stairway doors is deleted in its entirety and addressed by Appendix L, Access Control Systems.

SECTION 1009
STAIRWAYS

Section 1009.11 Stairway to roof

1009.11.1 Roof access is amended by deleting the exception.

Add Section 1009.12 as follows:

Section 1009.12 Roof hatches in buildings four or more stories above grade. All required interior stair enclosures that extend to the roof in any building four or more stories above grade, shall have, at the highest point of the stair enclosure, a roof hatch per IFCA Section 504.4.

Exception:

Roof hatches are not required on pressurized stair enclosures and on stair enclosures complying with IBCA Section 1009.11.1.

SECTION 1011
EXIT SIGNS

Replace Section 1011.2 Illumination as follows:

1011.2 Illumination. Exit signs shall be internally illuminated.

Exception:

Tactile signs required by Section 1011.3 need not be provided with illumination.

Add Section 1011.4.1 as follows:

1011.4.1 Graphics. One of the following lettering / field combinations shall be used:

1. White luminous on green luminous field.
2. Green luminous on white luminous field.
3. White light emitting diodes on green field.
4. Green light emitting diodes on white field.

Add Section 1011.4.2 as follows:

1011.4.2 Exit sign illumination. Exit signs shall be electrically illuminated to an intensity level of 5.0 foot candles. Non-LED signs shall be illuminated by a minimum of two electric lamps.

Add Section 1011.4.3 as follows:

1011.4.3 Power source. Exit signs shall be illuminated at all times. To ensure continued illumination for a duration of not less than 90 minutes in case of primary power loss, the sign illumination means shall be connected to an emergency power system provided from storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with IFC Section 604 as amended.

Delete Section 1011.5.

SECTION 1014
EXIT ACCESS

Section 1014 Common path of egress travel.

1014.3 Common path of egress travel is amended by adding to 903.3.1.2 (NFPA 13R) system to exception 4.

Exception:

4. The length of common path of egress travel in a group R-2 occupancy shall not be more than 125 feet, provided the building is protected with an approved sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

Section 1014.4.1 Aisles in group B and M is deleted in its entirety and replaced by the following:

1014.4.1 Aisles in groups B, F, M and S. In Group B, F, M and S occupancies, the minimum clear aisle width shall be determined by Section 1005.1 for the occupant load served, but shall not be less than 36 inches (914 mm).

Exceptions:

1. Non public aisles serving less than 50 people and not required to be handicap accessible shall not be less than 28 inches (711 mm) in width.
2. High-piled combustible storage areas shall comply with the applicable provisions of Chapter 23 of the Fire Code.

SECTION 1020
VERTICAL EXIT CLOSURES

Section 1020.1.7 Smoke proof enclosures is amended by adding a reference to IFCA Section 909.20.:

1020.1.7 Smokeproof enclosures. In buildings required to comply with Section 403 or 405, each of the exits of a buildng that serve stories where the floor surface is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access or more than 30 feet (9144 mm) below the level of exit discharge serving such floor levels shall be a smokeproof enclosure or pressurized stairway in accordance with IFCA Section 909.20.

Delete Section 1020.1.7.2.

SECTION 1025
ASSEMBLY

[F] Section 1025.12 Seat stability has been replaced in its entirety as follows:

1025.12 Seat stability. In places of assembly, the seats shall be securely fastened to the floor.

Exceptions:

1. Seats are not required to be fastened to the floor in places of assembly or portions thereof:
   - with 100 or fewer seats, and
   - with an actual net area per occupant greater than or equal to 7 sq. ft., and
   - without ramped or tiered floors for seating.
2. Seats are not required to be fastened to the floor in places of assembly or portions thereof:
   - with 100 or fewer seats, and
   - with an actual net area per occupant greater than or equal to 7 sq. ft., and
   - with ramped or tiered floors for seating, and
   - where plans showing seating, tiers and aisles were submitted to, reviewed and permitted by the Fire Code Official.
3. Seats are not required to be fastened to the floor in places of assembly or portions thereof:
   - with more than 100 and fewer than 200 seats, and
   - with an actual net area per occupant greater than or equal to 7 sq. ft., and
   - without ramped or tiered floors for seating, and
   - with seats fastened together in groups of five or more.
4. Seats are not required to be fastened to the floor in places of assembly or portions thereof:
   - with seating at tables, and
   - with an actual net area per occupant greater than or equal to 15 sq. ft., and
   - without ramped or tiered floors for seating.
5. Groups of seats are not required to be fastened to the floor in places of assembly or portions thereof:
   - with 14 or fewer seats per group, and
   - with an actual net area per occupant greater than or equal to 7 sq. ft., and
   - without ramped or tiered floors for seating, and
   - groups are separated from other seating by railings, guards, partial height walls or similar barriers.
6. Seats intended for musicians or other performers and separated by railings, guards, partial height walls or similar barriers shall not be required to be fastened to the floor.
7. In special events permitted by Section 105.6 of the Fire Code, loose seats, folding chairs or similar seating facilities that are not fixed to the floor shall be securely fastened together in groups of five or more.

CHAPTER 11
ACCESSIBILITY

SECTION 1101
GENERAL

Section 1101.1 Scope is amended by adding the following sentence:

1101.1 Scope. In addition to the requirements of this chapter, the provisions of Title 9, Article 5, Colorado Revised Statutes, as amended, Standards for Accessible Housing, shall be enforced by this Code. Title 9, Article 5, C.R.S. as amended is reproduced in Appendix M of this Code for reference.

Section 1101.3 Notice and Warning is added, reading as follows:

1101.3 Notice and Warning. Although the Code enforces the provisions of Title 9, Article 5, C.R.S., as amended, as set out in Section 1101.1 above, the Code has not been certified or otherwise conformed by the U.S. Government or State of Colorado to the requirements or the Americans with Disabilities Act ("ADA") the Rehabilitation Act, the HUD Fair Housing Act or any other State of Colorado accessibility laws, including but not limited to the Colorado Anti-Discrimination Act ("CADA").

Therefore, compliance with the Code does not assure compliance with Titles II or III of the ADA, the Rehabilitation Act, the HUD Fair Housing Act or any other Federal or State laws, except as provided in Section 1101.1 above, or any regulations or guidelines enacted or promulgated with respect to such laws. The City and County of Denver is not responsible for enforcement of the ADA, Rehabilitation Act, HUD Fair Housing Act or such other Federal or State laws, except as provided in Section 1101.1 above.

Building plans submitted under this Code will be reviewed and inspected for compliance with the Code and will not be reviewed or inspected for compliance with the requirements of the ADA, Rehabilitation Act, HUD Fair Housing Act or other Federal or State laws, except as provided in Section 1101.1 above. Therefore, it is the sole responsibility of the developer or building owner to have their plans or facilities independently evaluated by knowledgeable professionals in order to comply with the applicable requirements of the above-listed laws.

Any modification to a building will require a building permit.

Section 1107.6.2.1 is amended by revising the first paragraph creating categories for "For Sale" and "For Rent" Type A Units: The Exceptions following the first paragraph are to remain as stated. Table 1107.6.2.1 is added.

1107.6.2.1.1 Type A units. In Group R-2 occupancies, Type A "For Sale" projects containing more than 20 dwelling units or sleeping units, at least 2 percent but not less than one of the units shall be a Type A unit. Type A "For Rent" dwelling units or sleeping units in Group R-2 occupancies shall be in accordance with Table 1107.6.2.1. All units on a site shall be considered to determine the total number of units and the required number of Type A units. Type A units shall be dispersed among the various classes of units.

TABLE 1107.6.2.1
REQUIRED TYPE A "FOR RENT" DWELLING UNITS

Total Number of Dwelling Units on Site	Required Number of Type A Dwelling Units
0 – 10	None
11 – 20	1
21 – 40	2
41 – 60	3
61 – 80	4
81 – 100	5
For every 20 units or fractional part thereof, over 100	1 additional

CHAPTER 15
ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

SECTION 1503
WEATHER PROTECTION

Section 1503.2 Flashing

Section 1503.2.2 is added

1503.2.2 Flashing for Single-ply roof systems. All flashing installations for single-ply roofing systems shall be installed per manufacturers' latest recommendations and details for the system.

Section 1503.2.3 is added

1503.2.3 Mechanical equipment on roof. Mechanical equipment placed, replaced and reset on roofing shall be supported on 8-inch curbs or legs, which shall be flashed to the roofing and made watertight.

Section 1503.4 Roof drainage

1503.4.2 Drain Installation for Single-Ply System is added.

1503.4.2 Drain Installation for Single-Ply System. Drains for single-ply roof systems shall be installed per the latest manufacturers' details and recommendations.

Section 1503.6 Vertical Projections is added.

1503.6 Vertical Projections. All projections through the roof surface shall be properly flashed to prevent moisture entry.

1. Pipe penetrations shall be completed with a standard roof jack, flashed per manufacturer-recommended details or fold flashed. Pitch pans are prohibited.
2. Pitch pans may be used to flash multiple penetrations with prior approval. Pourable sealer or sheet metal caps shall be used to seal pitch pans.
3. Mechanical penetrations may penetrate through properly sized flashing extended 8 inches above the finished roofing deck with a storm collar.

SECTION 1507
REQUIREMENTS FOR ROOF COVERINGS

Section 1507.2 Asphalt Shingles

Section 1507.2.8 Asphalt Shingles is amended by adding exception.

Exception:

An accepted self-adhering polymer modified bitumer sheet can substitute for a double underlayment installation.

Section 1507.2.9.2 Valleys is amended by adding item 4.

4. Metal liners shall not be installed in closed valleys.

Section 1507.3 Clay and Concrete Tile

Section 1507.3.10 Inspection of Tile Roofs is added.

1507.3.10 Inspection of Tile Roofs. Mid-roof inspections shall be requested when no more than 30% of the roofing is completed.

Section 1507.6 Mineral Surfaced Roofing

Section 1507.6.2 is amended by replacing it in its entirety with the following:

1507.6.2 Deck Slope. Mineral surfaced rolled roofing (90 lbs.) shall not be applied on roof slopes below two units vertical in twelve units horizontal.

Exception:

Detached garages, patios and carports open on three sides may have a slope of one unit vertical in twelve units horizontal.

Section 1507.10 Built-up roofs

Section 1507.10.3 Flashing for Interior Roof Drains is added.

1507.10.3 Flashing for Interior Roof Drains. Flashing for interior roof drains shall be one of the following:

A minimum of 2 x 2 feet, 4-pound lead sheet or lead-copper coated sheet, set on completed felts in flashing cement.

The metal shall be turned a minimum of ½ inch into a drain sump and plied with 2 plies of type 4 felt or modified bitumen membrane of sufficient dimension to extend a minimum of 6 inches past metal sheet.

A 2-component drain system. The membrane flashing shall be polyvinylchloride sheet measuring 22 inches in length and factory attached to the underside of the strainer flange. The membrane flashing shall be applied on top of the completed felt and shall extend a minimum of 6 inches from the outside diameter of the drain throat, shall be set into hot asphalt or approved sealants and plied in with 2 plies of type 4 felt.

Drain details for single-ply systems shall be per manufacturers' specifications.

Section 1507.10.4 Flashing – New Built-Up Roof Covering is added.

Section 1507.10.4 Flashing – New Built-Up Roof Covering. Flashing shall be installed on all vertical walls and curbs in accordance with the manufacturers' specifications or as follows:

1. All flashing surfaces shall be primed.
2. All flashing shall extend at least 8 inches, but not more than 12 inches, up all vertical surfaces and at least 4 inches out from base of cant or at intervals specified by manufacturer.
3. The top edges of the flashing shall be fastened at 3-inch intervals and sealed with plastic cement.
4. All vertical walls and projections shall be counter-flashed with a 2-piece metal system installed watertight.
5. Nailer strips shall be provided on vertical walls, drips in edge and curbs which will not accept conventional nailing.

Section 1507.10.5 Stucco is added.

Section 1507.10.5 Stucco. Stucco on walls extending above the roof shall terminate a minimum of 2 inches above the finished roofing of a flat roof and 2 inches above shingle, shake and tile roofs.

Section 1507.10.6 Drainage testing is added.

Section 1507.10.6 Drainage testing. Positive drainage shall be required. Approval drainage test shall pass when "no-standing" water remains on the roof after 72 hours with an average temperature of 70 degrees.

SECTION 1510
REROOFING

Section 1510 Reroofing of Built-Up Roofs is added.

Section 1510.7 Reroofing of Built-Up Roofs. Pre-roofing inspection shall be made by this Agency for all commercial built-up and single ply systems to verify that the existing roof meets the following conditions:

The existing roof deck is structurally sound.

The roof drains and roof drainage are sufficient to prevent the ponding of water.

The existing roofing is secured to the existing roof deck.

The existing insulation is not wet (a 3rd party moisture scan may be required).

The fire-retardant classification of the roof shall be maintained.

CHAPTER 16
STRUCTURAL DESIGN

SECTION 1607
LIVE LOADS

Section 1607 shall be used in its entirety except as amended below:

1607.14 Fire Truck Loading. Where fire department access requires travel over or loading of a structure by fire department vehicles, the structure shall be analyzed for the three load cases for each of the two vehicle types indicated below. Structural members shall be designed for the most severe case. The fire vehicle geometries are shown in Figures 1607.14 (1) and (2).

Platform Truck – Figure 1607.14 (1)

Basic Load Case:

The front axle load shall be 22,800 pounds (11,400 pounds per tire) with a tire contact area of 12 in. x 13 in. The load on each rear axle shall be 27,000 pounds (13,500 pounds per tire) with a tire contact area of 14 in. x 16 in. Impact and longitudinal forces imparted by the vehicle loads shall be in accordance with the latest edition of AASHTO standards.

Static Load Case A:

A load of 38,500 pounds on one outrigger. The contact area of each outrigger is 24 in. x 24 in. The load is to be located so as to produce the maximum stress in the member(s) being analyzed when applied according to the geometry of Figure 1607.14. (1).

Static Load Case B:

A load of 30,000 pounds on each of two adjacent outriggers (total load is 60,000 pounds). The contact area of each outrigger is 24 in. x 24 in. The load is to be located so as to produce the maximum stress in the member(s) being analyzed when applied according to the geometry of Figure 1607.14. (1).

Ladder Truck – Figure 1607.14 (2)

Basic Load Case:

The front axle load shall be 22,800 pounds (11,400 pounds per tire) with a tire contact area of 12 in. x 13 in. The load on the rear axle shall be 31,000 pounds (15,500 pounds per tire) with a tire contact area of 14 in. x 16 in. Impact and longitudinal forces imparted by the vehicle loads shall be in accordance with the latest edition of AASHTO standards.

Static Load Case A:

A load of 29,000 pounds on one outrigger. The contact area of each outrigger is 24 in. x 24 in. The load is to be located so as to produce the maximum stress in the member(s) being analyzed when applied according to the geometry of Figure 1607.14.(2).

Static Load Case B:

A load of 20,000 pounds on each of two adjacent outriggers (total load is 40,000 pounds). The contact area of each outrigger is 24 in. x 24 in. The load is to be located so as to produce the maximum stress in the member(s) being analyzed when applied according to the geometry of Figure 1607.14.(2)

The Fire Prevention and Investigation Division shall determine the area around any building or structure for which fire access and, therefore, the provisions of this section are required.

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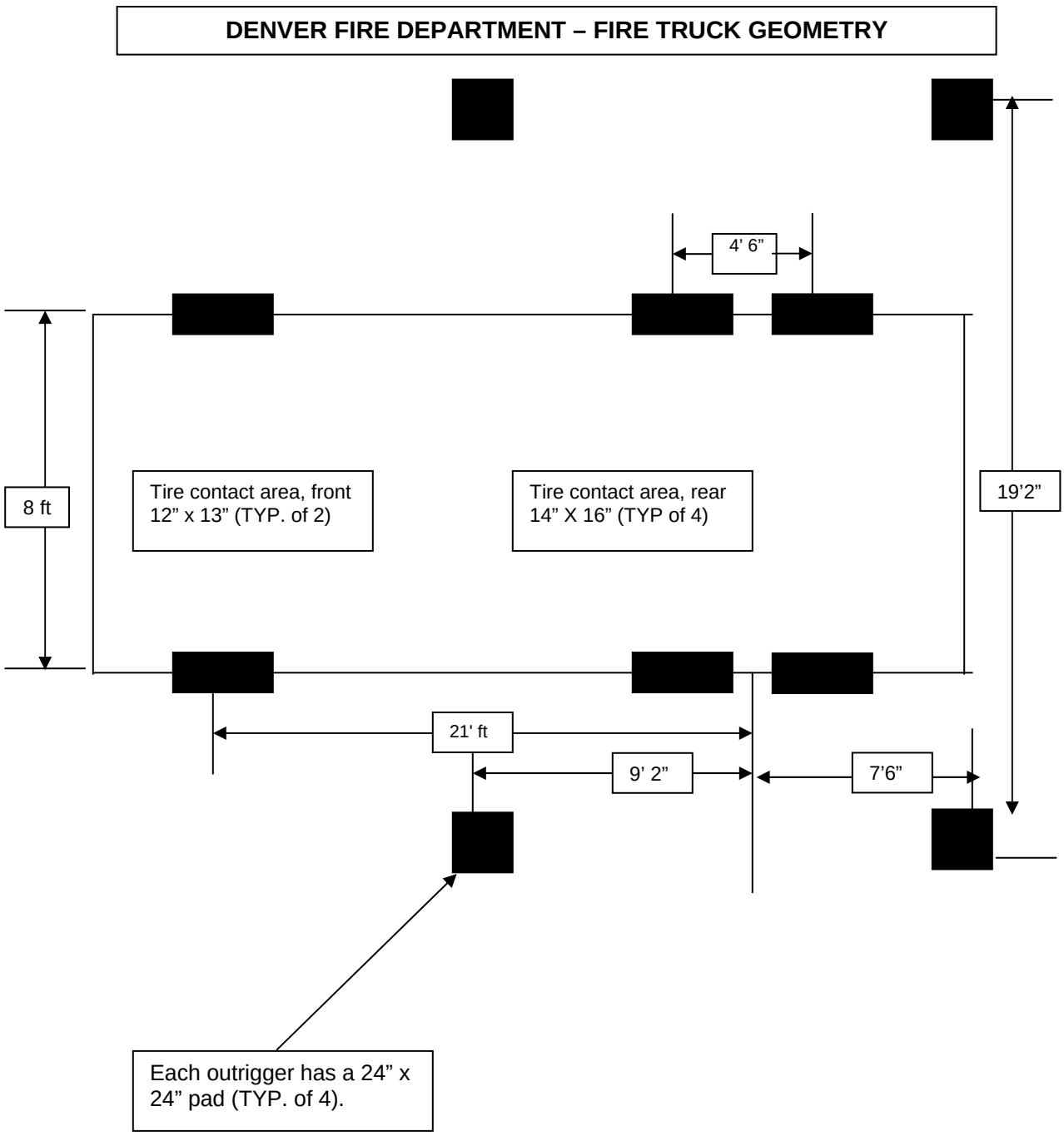


FIGURE 1607.14 (1) – PLATFORM TRUCK

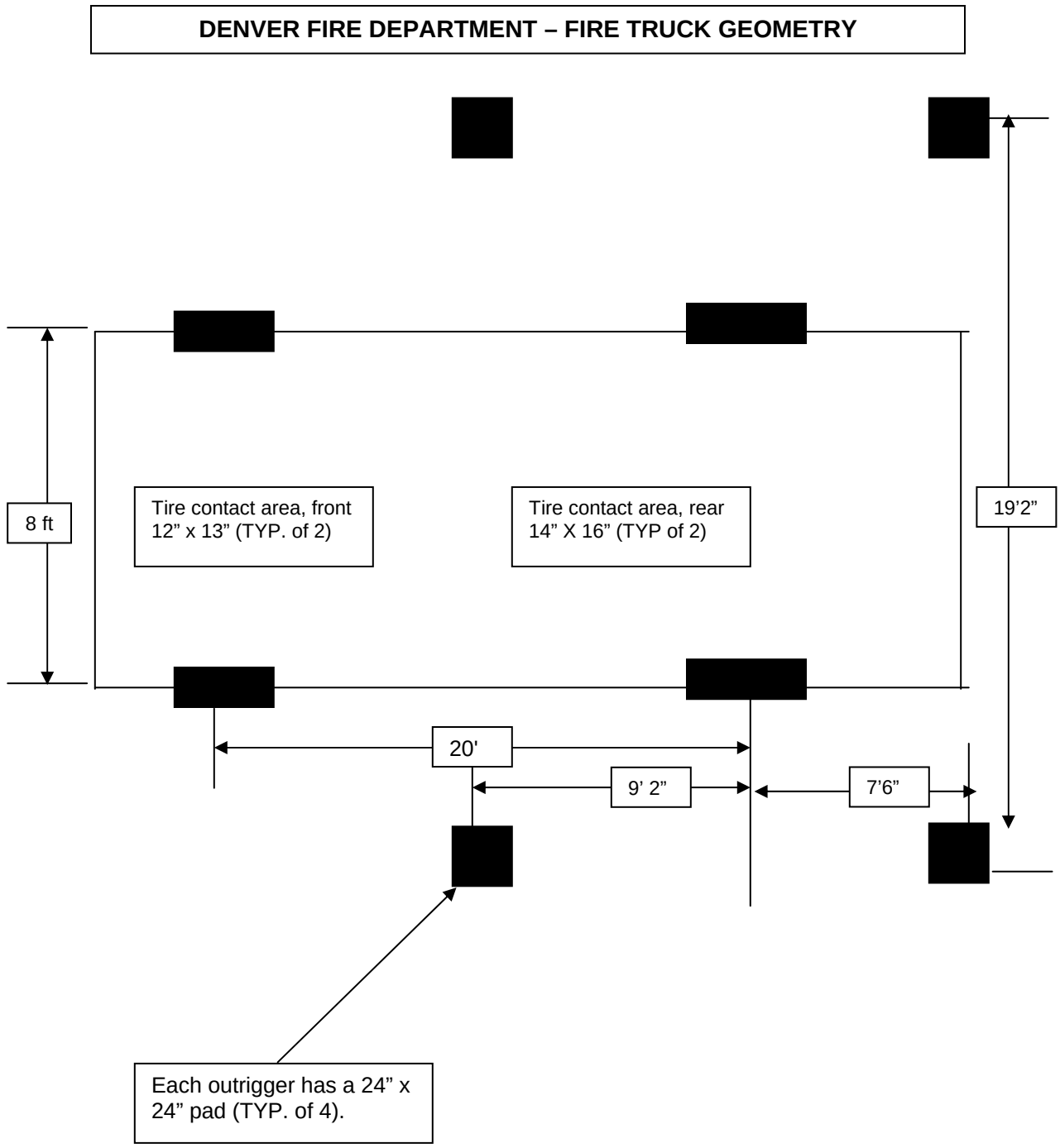


FIGURE 1607.14 (2) – LADDER TRUCK

SECTION 1608
SNOW LOADS

Section 1608 Snow Loads shall be used in its entirety except as amended below:

1608.1 General. Design snow loads shall be determined using whichever of the following criteria produces the largest stress in the member(s) being designed.

1608.1.1 Criteria 1. Design snow loads, including drifting and unbalanced snow loads, shall be determined in accordance with Section 7 of ASCE 7, Minimum Design Loads for Buildings and Other Structures.

1608.1.2 Criteria 2. Neglecting drifting, unbalanced loadings, and snow load importance factors, a uniformly applied roof snow load (p_f or p_s) shall be:

A uniformly applied load on the entire exposed area of 30 pounds per square foot for all structures in the occupancy Categories III and IV of Table 1604.5.

A uniformly applied load on the entire exposed area of 25 pounds per square foot for all other structures.

Roofs used for parking of passenger vehicles shall be designed for a total non-reducible uniform load of 55 psf. This load need not be combined with other snow loads or other live loads applied to the roof.

1608.2 Ground Snow Loads. Ground snow load for use with the procedures of ASCE 7 shall be 25 pounds per square foot.

1608.3 Snow Load Importance Factor. The values for the snow load importance factor I, in Table 7-4 of ASCE 7 shall be amended as follows:

Category III.....1.2
Category IV.....1.4

1608.4 Rain-on-Snow Surcharge Load need not be considered.

1608.5 Additional Criteria. Snow loads are not to be considered as reducible live loads.

SECTION 1609
WIND LOADS

Section 1609 Wind Loads shall be used in its entirety except as amended below:

1609.1.1.2 Reduction for air density. In calculating velocity pressures using Eq. 6-15 in ASCE 7, the numerical constant, 0.00256, may be reduced to account for air density. Any reduction shall comply with ASCE 7, Section C6.5.10, but in no case shall the reduction in the numerical constant exceed fifteen percent.

1609.3 Basic wind speed. The basic wind speed, to be used in the provisions of ASCE 7, shall be 90 miles per hour ($V_{3s,}$ three second gust) for all areas in the City and County of Denver located east of a line defined as the centerline of Federal Boulevard. For areas located west of the centerline of Federal Boulevard, the basic wind speed (V_{3s}, three second gust) shall be interpolated between the contours as defined in the report titled "Colorado Front Range Gust Map" dated February 28, 2006, in which the 90 mph contour is located along the centerline of Federal Boulevard, the 100 mph contour is located along the centerline of Sheridan Boulevard, and the 110 mph contour is located along the centerline of Kipling Boulevard. The centerlines of Federal Boulevard, Sheridan Boulevard, and Kipling Boulevard, are assumed to be projected to the north and south boundaries of the City and County of Denver.[1]

SECTION 1613
EARTHQUAKE LOADS

Section 1613 Earthquake Loads, shall be used in its entirety except as amended below:

1613.5.2 Site Class Definition. Based on the site class properties, the site shall be classified as either Site Class A, B, C, D, E, or F in accordance with Table 1613.5.2. Any assignment of site class NOT based on soil shear wave velocity, measured for the top 100 feet of the soil profile, shall comply with the following limitations:

No site shall be assigned as Site Class A, B, or C when bedrock has an overburden depth greater than 15 feet, as measured from the top of bedrock to the finished grade.

No site shall be assigned as Site Class A or B when bedrock has an overburden depth less than or equal to 15 feet, as measured from the top of bedrock to the finished grade.

When the soil properties are not known in sufficient detail to determine the site class, Site Class D shall be used unless the building official or geotechnical data determines that Site Class E or F soil is likely to be present at the site.

1613.5.6.3 Seismic Design Category, Minimum. All buildings and structures in the City and County of Denver shall satisfy the requirements of seismic design category B, as a minimum.

CHAPTER 17
STRUCTURAL TESTS AND SPECIAL INSPECTIONS

SECTION 1704
SPECIAL INSPECTIONS

Section 1704.1 General and Section 1704.1.1 Statement of special inspections are amended by replacing the reference to Section 109 to Administration of the Denver Building Code and Administrative Section 154.1, item 3B.

CHAPTER 18
SOILS AND FOUNDATIONS

SECTION 1805
FOOTINGS AND FOUNDATIONS

Section 1805 Footings and Foundations shall be used in its entirety except as amended below:

Section 1805.2.1 Frost Protection. The following sentence is added. The frost line for the City and County of Denver is to be 36 inches (915 mm) below the finished grade.

Section 1805.4.1 Design. Footings shall be so designed that the allowable bearing capacity of the soil is not exceeded, and differential settlement is minimized.

Footing in areas with expansive soils shall be designed in accordance with the provisions of Section 1805.8.

Section 1805.5 Foundation Walls shall read as follows: Concrete and masonry foundation walls shall be designed in accordance with Chapter 19 or 21. Foundation walls that are laterally supported at the top and bottom and within the parameters of Tables 1805.5(1) through 1805.5(4), are permitted to be designed and constructed in accordance with Sections 1805.5.1 through 1805.5.5 except that the maximum bar spacing shall not exceed 24 inches (610 mm).

Section 1805.5.3 Alternative Foundation Wall Reinforcement shall read as follows: In lieu of the reinforcement provisions in Table 1805.5(2), 1805.5(3), or 1805.5(4), alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per linear foot (mm) of wall is permitted to be used, provided the spacing of reinforcement does not exceed 24 inches (610 mm) and reinforcing bar sizes do not exceed No. 11.

SECTION 1810
CAST-IN-PLACE CONCRETE PILE FOUNDATIONS

Section 1810 Cast-in-place Concrete Pile Foundations shall be used in its entirety except as amended below:

Section 1810.3.2 Dimensions. The length shall not exceed 30 times the average diameter.

Exception:

The length of the pile is permitted to exceed 30 times the diameter, provided that the design and installation of the pile foundation are under the direct supervision of a registered design professional knowledgeable in the field of soil mechanics in compliance with the approved construction documents.

CHAPTER 27
ELECTRICAL

SECTION 2700
GENERAL - DENVER

Sections 2700.1 and 2700.2 are added.

Section 2700.1 Electrical Code References. All references in this Code to the "ICC Electrical Code" are changed to the "Electrical Code as adopted by the State of Colorado".

Section 2700.2 Service Masts. Where a mast is required to maintain the overhead conductor height required by the Electrical Code, the mast shall be a minimum of 2 inch Rigid Metal Conduit or 2 inch Intermediate Metal Conduit. All masts over 48 inches in height shall be appropriately guyed to counter stresses from the service drop.

CHAPTER 29
PLUMBING SYSTEMS

[P] SECTION 2902
MINIMUM PLUMBING FACILITIES

Section 2902.1 is amended by replacing it in its entirety with the following:

Section 2902.1 Minimum Number of Fixtures. Plumbing fixtures shall be provided for the type of occupancy and in the minimum number shown in Table 2902.1. Type of occupancies not shown in Table 2902.1 shall be considered individually by the Code Official. The number of occupants shall be determined by the International Building Code, Table 1004.1.2. Occupancy classification shall be determined in accordance with the International Building Code.

Sections 2902.7, 2902.8, 2902.9, and 2902.10 are added:

[EH] Section 2902.7 Access. There shall be no access through a toilet room to any portion of a building. Access to toilet rooms shall not be through food preparation areas, except for toilet room facilities provided exclusively for the use of employees in the food preparation area.

[EH] Section 2902.8 Toilet room accessories. A minimum of one hand-drying facility shall be provided in each toilet room where lavatories are provided.

[EH] Section 2902.9 Location of service sinks. Except for Group R occupancies, service sinks are required on each floor where toilet facilities are required. Service sinks shall not be installed in toilet rooms.

Section 2902.10 Restaurants

1. The number of occupants for a drive-in restaurant or drive-in theater shall be considered as equal to twice the number parking stalls.
2. Employee toilet facilities are not to be included in the above restaurant requirements.

CHAPTER 30
ELEVATORS AND CONVEYING SYSTEMS

SECTION 3001
GENERAL

Section 3001.2 Referenced standards is amended by adding the following:
ASME A 17.1 A-2004 addenda and A17.1S Supplement Safety Code for Elevators and Escalators
ASME 18.1-2003 Safety standard for Platform Lifts and Stairway Chairlifts
ASME A110.4 later addition Personnel Hoists

SECTION 3002
HOISTWAY ENCLOSURES

Section 3002.3 is amended by adding the following sentence to the end of the paragraph:
All exit stairs and areas of refuge shall be graphically located on a sign adjacent to the elevator call buttons. Sign shall comply with ICC A117.1.

[F] SECTION 3003
EMERGENCY OPERATIONS

[F] Section 3003.1 Standby Power. The title of [F] Section 3003.1 is amended by changing the title to "Emergency Power" and any reference to standby power in the subsections of 3003.1 to emergency power to coordinate with IFCA Section 604.2.19.

Section 3003.1.3.1 is added:

3003.1.3.1 Two or More Elevators in High Rise Building:

Sufficient emergency power shall be provided to simultaneously operate two elevators for each group of elevators controlled by a common operating system. Additional emergency power shall be provided for the elevator car that has been designated to accommodate an ambulance stretcher as described in Section 3002.4 if this car is not included in one of the groups above.

Exception:

Sufficient emergency power shall be provided for only one elevator for each group of elevators controlled by a common operating system that serve only open parking levels of the High Rise building.

SECTION 3004
HOISTWAY VENTING

Section 3004.1 is amended by adding exceptions 3, 4 and 5 and specify where permanent open vents are permitted.

Exceptions:

3. Hoistway in High Rise buildings shall comply with the High Rise provisions of IBC/IFC Chapter 9.
4. Residential elevators need not to be vented.

5. Stand alone open parking garages.

Permanent open vents shall be permitted in the following hoistways:

1. Hoistways in unheated buildings
2. Unheated outside hoistways
3. Hoistways that do not extend to the roof of an atrium

Section 3004.1.1 Vent Operation is added:

Section 3004.1.1 Vent Operation: All hoistway vents shall be closed, motorized vents (electrically) and shall open automatically by activation of the elevator hoistway smoke detector and/or a power failure. Refer to the IFC amendments in the Fire alarm System Section for further clarification regarding control and sequencing.

SECTION 3005
CONVEYING SYSTEMS

Section 3005.1 General is amended by adding an exception.

Exception:

Material handling conveyors and conveying systems are not regulated by this Code.

SECTION 3007
ELEVATOR RECALL FOR HIGH RISE BUILDINGS WITH PRESSURIZED HOISTWAYS

Section 3007 Elevator Recall for High Rise Buildings with Pressurized Hoist ways is added:

3007 Elevator Recall for high-rise buildings with pressurized hoist ways. In addition to the requirements of A17.1, Fire Fighters' service, elevator operation within highrise buildings with pressurized hoist ways shall be as follows:

The elevator doors shall automatically open when the car reaches the approved level. After a period of one minute, elevators shall automatically close their doors. The doors shall be responsive by pressing the designated return floor call button in the elevator lobby or by pressing the door open button in the interior of the elevator cab. Elevators shall remain at that level until manual overrides by the key-operated switch required by ASME 17.1.

Only the hall call buttons at the designated return level, the level the car(s) have returned to, shall function as door open buttons. All doors shall open simultaneously when operating under normal building power. When operating under emergency power, only the cars selected for emergency operation shall open their doors simultaneously.

During Phase 1 operation, the door recycle shall be 60 seconds.

Once the car is placed on Phase II, the fire department has control of the elevator; it shall operate per ASME A17.2 rule 2113.c, Normal Phase II Operation.

SECTION 3008
ELEVATOR, ESCALATOR AND MOVING SIDEWALK ACCIDENT REPORTING

3008.1 Definitions. For the purpose of this section, "accident" means a malfunction of an escalator or moving sidewalk that results in an injury to a person or persons or that results in damage to the affected equipment, other than merely cosmetic damage. For the purposes of this section, "injury" means an injury to a person that results in treatment by a doctor or other medical professional.

3008.2 Time to report. Any accident involving an elevator, escalator or moving sidewalk that results in injury shall be reported to the Agency within 24 hours after the accident by the owner or managing agent of the property in or on which said equipment is located. Any accident that does not involve injury shall be reported to the Agency within 48 hours. A written report by the owner or agent shall be filed with the Agency within 72 hours.

3008.3 After accident operation. When an escalator or moving sidewalk accident causes an injury, the equipment shall not be operated until such operation is approved by the Agency. A representative of the Agency shall make an on-site visit to examine the equipment within 24 hours of the initial report to the Agency.

3008.4 Removal. No portion of equipment involved in an accident that is reported under Section 3008.2 shall be removed from the premises until approval for such removal has been granted by the Agency.

CHAPTER 31
SPECIAL CONSTRUCTION

SECTION 3105
AWNINGS AND CANOPIES

Section 3105.5 Canopy Special Provisions is added:

Section 3105.5 Canopy Special Provisions.

A. A canopy may be entirely supported by the building to which it is attached.

B. Separation between different types of construction shall not be required.

C. Canopies shall comply with Fire Department access requirements. The minimum height of canopies at locations not requiring Fire Department access shall be 8 feet.

D. Canopies in the public right-of-way shall comply with Section 3202.

E. Canopies shall not obstruct required exits.

F. For the purposes of this code, a porte-cochere may be considered a canopy.

Section 3110 is added:

[CDH] SECTION 3110
MANUFACTURED OR FACTORY-BUILT STRUCTURES

Section 3110.1 Definitions.

1. Manufactured or Factory-built Structures shall mean factory-assembled structures which are completely finished to include all utilities and are transported to a site of permanent installation. This shall include mobile homes, factory-built housing and non-residential structures as defined by state and federal regulations.

2. Federal Act shall mean the National Manufactured Home Construction and Safety Standards Act of 1974, 42 USCA, Sections 5401 to 5426, and the rules and regulations promulgated thereunder.

3. Colorado Housing Act shall mean the Colorado Housing Act of 1980 as amended, Title 24, Article 32, Part 7 of the Colorado Revised Statutes.

Section 3110.2 Factory Approval of Manufactured Structures.

1. Housing manufactured in or out of state under the Federal Act are inspected and approved by a HUD-authorized Product Primary Inspection Agency (IPIA). The manufacturer shall permanently attach a HUD label (seal) to the exterior of the home on the tail light end of each transportable section. Each manufactured home shall bear a data compliance sheet (plate) permanently affixed to the interior of the home near the electrical panel in a visible location. The data compliance sheet (plate) shall show structural zone and snow and wind loads for which the home has been designed, thus determining whether the home does or does not meet the Colorado requirements of the Federal Act.

2. Manufactured structures not constructed to the Federal Act shall be constructed in compliance with the Colorado Housing Act or the Colorado Factory Build Nonresidential Structures Act. The Colorado Division of Housing shall be the inspection agency and shall require a permanent Colorado approval label (seal) with a factory-built (FB) certification number attached to each unit.

3. Other factory-built structures are not allowed. Prefabricated systems for residential or nonresidential use shall comply with the other sections of this Chapter. For example:

i. Stressed skin panels assembled at the site for roof, floor and walls.

ii. Shell type units.

Section 3110.3 Permits Required. The installation of factory-built structures shall comply with all provisions of the Building Code except the plans for the MHU are not required when either of the following items are provided to the Department:

A. A data compliance sheet for HUD-approved manufactured housing units.

B. A copy of the Colorado approval label (seal) with a legible factory-built certification number.

Section 3110.4 Seal. A Colorado Division of Housing approval label (seal) must be permanently affixed to each factory-built structure.

Section 3110.5 Inspection and Notice. The Federal Act and the Colorado Housing Act preempt the Building Code in relation to factory-built structures; therefore the Agency does not inspect them. However, the Agency shall inspect the foundation, installation of utilities and installation of the factory-built structures to the foundation.

1. The following notices shall be given to all persons applying for any permit relating to manufactured homes and factory-built structures from any agency of the City:

   a. "In accordance with Federal and Colorado law, this manufactured structure has not been inspected by the City and County of Denver and may or may not meet the requirements of the Denver Building Code.

   b. ”It shall be the obligation of the permit applicant to forward this notice to the owner of the manufactured home or factory built structure.”

2. The notice set forth in Subsection A above shall be permanently installed in a visible location by the permit applicant adjacent to the date plate required by the Federal Act or in the furnace closet on factory-built structures.

CHAPTER 32

ENCROACHMENTS INTO THE PUBLIC RIGHT-OF-WAY

[PW] SECTION 3202 ENCROACHMENTS

Section 3202.2 is deleted in its entirety and replaced with the following:

Section 3202.2 Encroachments. All encroachments shall comply with the Denver Revised Municipal Code, Chapter 49, Rules & Regulations of the Department of Public Works, and all departmental published standards.

Exception:

1. Existing doors and windows of historic buildings whether individually designated or contributing buildings in a Historic District or in buidings 50 years or older. New entrance / exit doors constructing in historic facades may encroach up to 3’ into the street frontage of the right of way when a recessed opening is not in character with the existing façade.

2. In new construction, doors and windows shall not open or project into the public right of way.

Section 3202.3 is reserved.

Section 3202.4 Temporary Encroachments is amended to replace the first sentence with the following:

Section 3202.4 Temporary Encroachments. Where allowed by the local authority having jurisdiction, vestibules and storm enclosures shall not be erected for a period of time exceeding 7 months in any one year and shall not encroach more than 3 feet (914 mm) nor more than one-fourth of the width of the sidewalk beyond the street lot line, unless otherwise permitted by the Department of Public Works.

CHAPTER 33
SAFEGUARDS DURING CONSTRUCTION

Section 3303 is amended by replacing it in its entirety with the following:

SECTION 3301
GENERAL

Section 3301.1 shall be deleted and replaced with the following:

Section 3301.1 Scope. The provisions of this chapter shall govern safety during construction, demolition and moving and the protection of adjacent public and private properties.

Section 3301.3 shall be added:

Section 3301.1 Demolition and Moving Standard. Unless provided for in other portions of this Building Code, the following additional standard shall be utilized in relation to the work covered in this chapter, American National Standard Institute publication, "Demolition Safety Requirements A10.6-1990".

SECTION 3302
CONSTRUCTION SAFEGUARDS

[PW] Section 3302.2 shall be amended by the addition of the following sentence:

All adjacent streets, alleys and other public ways and places shall be kept free and clear of all rubbish, refuse and loose material resulting from the moving, demolition or demolition removal operations.

[EH] Section 3302.2.1 Dust shall be added.

Section 3302.2.1 Dust. All dust resulting from demolition operations shall be settled with water and approved by the Agency.

SECTION 3303
DEMOLITION

Section 3303.1.1 shall be added:

Section 3303.1.1 Registered Design Professionals' Reports. If the building to be demolished shares a common wall with an adjacent building, the owner of the building to be demolished shall provide a registered design professional's report assessing the effect the removal of the adjacent building will have on the structural capacity and stability of the remaining buildings. Should the registered design professional's report indicate adverse effects on the adjacent buildings, a demolition permit will not be issued until the stability of the buildings is resolved. Except as approved by the Agency, buildings four (4) or more stories in height shall require a registered design professional's report to be filed with the Agency as part of the application for a demolition permit being issued. The registered design professional's report shall contain, but is not limited to, information as to:

1. Type of construction
2. Method of demolition
3. A structural survey made to determine the condition of the structure
4. Determination of the possibility of unplanned collapse of any portion of the building or structure
5. Street, sidewalk or other public way closures
6. Method of protecting the public
7. Pertinent data and analysis pertaining to adjacent structures

The Agency may request additional registered design professionals' reports for other demolition operations when deemed necessary.

Section 3303.1.2 Shoring and Bracing of Damaged Structures shall be added:

3303.2.1 Shoring and Bracing of Damaged Structures. When persons are required to work within a structure to be demolished which has been damaged by fire, flood, explosion or other cause, the structure shall be braced or shored for safety.

Section 3303.1.3 Asbestos shall be added:

[EH] 3303.1.3 Asbestos. Buildings, or portions of buildings, being demolished containing friable asbestos shall conform to the provisions of the National Emission Standard for Asbestos and all other federal and state regulations. A demolition permit shall not be issued until a copy of the notice is submitted to the Agency.

Section 3303.4 Vacant Lot shall be deleted and replaced by the following:

3303.4 Vacant Lot. Where a structure has been demolished or removed, the vacated lot shall be filled and maintained to the existing grade. Upon completion of the removal of a building, structure or utility, by demolition the ground shall be left in a clean, smooth condition. Holes, basements or cellars shall be filled with an inorganic material; provided, however, that the top one foot of fill shall be clean earth. The filling of such excavations shall not be required when a building permit has been issued for a new building on the site and construction is to be started within 60 days after completion of the demolition or moving operations. The holder of the building permit shall provide a temporary barricade protecting the excavation on all sides as specified for safety by the Agency. The temporary barricade may remain in position for a time not exceeding 3 days, after which a solid barricade or fence shall be provided or the excavation filled.

Section 3303.6 shall be amended by adding the following sentence:

All service utility connections shall be shut off, capped or otherwise controlled outside the building line, or area of demolition prior to beginning demolition work.

Section 3303.6.1 Relocation of Utilities shall be added:

3303.6.1 Relocation of Utilities. Any power, water or other utilities required to be maintained during demolition shall be temporarily relocated and protected.

Section 3303.6.2 Dangerous Utilities shall be added:

3303.6.2 Dangerous Utilities. A determination shall be made by the contractor if any type of hazardous chemicals, gases, explosives, flammable materials or similarly dangerous substances have been used in any pipes, tanks or other equipment on the property. When the presence of any such substance is apparent or suspected, testing and purging shall be performed by the demolition contractor and the hazard eliminated prior to demolition operations.

Section 3303.7 Machine and Explosive Demolition shall be added:

3303.7 Machine and Explosives Demolition. Machine demolition shall be subject to approval by the Agency.

Contractors utilizing explosives in their demolition operation shall be specifically approved by the Building Official. For storage and transportation of explosives, see the Fire Code for the City and County of Denver.

SECTION 3306
PROTECTION OF PEDESTRIANS

Section 3306.1.1 Safety Watchman shall be added:

3306.1.1 Safety Watchman. A second person, in addition to the equipment operator shall be present on the job site to act as a safety watchman to prevent the entry of unauthorized persons. On demolition sites, when approved by the Agency, the safety watchman may be used in lieu of site protection required by Section 3306.1.

SECTION 3307
PROTECTION OF ADJOINING PROPERTY

Section 3307.1 shall be deleted and replaced with the following:

3307.1 Protection required. Adjacent public and private property shall be protected from damage during construction, excavation, remodeling, demolition, and building relocation work. Protection is the responsibility of the person performing the construction, excavation, remodeling, demolition or building relocation work. Protection shall be provided

for footings, foundations party walls, chimneys, skylights, roofs, fences and landscaping. Provisions shall be made to control water runoff and erosion during construction, excavation, remodeling, demolition or relocation activities.

Section 3307.1.1 Notification. The person making or causing an excavation, demolition or relocation to be made shall provide written notice to the owners of adjacent properties, by certified mail with a return receipt, by personal notification or other means calculated to ensure the adjacent owners have actual notice, advising them that the excavation demolition or relocation is to be made providing contact information for the person doing the excavation, demolition or relocation and shall protect adjacent properties as required by Section 3307.1. Said notification shall be delivered not less than 10 days prior to the scheduled starting date of the excavation, demolition and/or relocation.

Written evidence of notification of adjacent owners or a written, signed statement as to why actual notice could not be given, must be given to the Building Official ten (10) working days before an excavation, demolition or relocation permit is issued.

Section 3307.2 Repair of Damage to Public Property shall be added:

3307.2 Repair of Damage to Public Property. As a condition of obtaining a permit to wreck or move any building, structure or utility, the permittee assumes liability for any damage to public property occasioned by such moving, demolition or removal operations. The permittee agrees to repair any damage to public property, including any public sidewalks, occasioned by such moving, demolition or removal operations. Failure to make such repairs within 30 days shall be grounds for the revocation of the contractor's license.

Section 3307.3 shall be added:

3307.3 Work Abutting the Public Way. Prior to the issuance of a permit by the Agency for the construction, demolition or relocation of any building involving excavation extending within one foot of the angle of repose or a slope of one to one under any public sidewalk, street, alley or other public property, the owner of the property or proposed building shall submit to the Manager of Public Works an indemnity bond in the amount determined by the Manager in a form approved by the City Attorney.

SECTION 3308
TEMPORARY USE OF STREETS, ALLEYS AND PUBLIC PROPERTY

Section 3308.3 shall be added:

[PW] 3308.3 Transportation Approval. Trucks and other equipment used by the contractor shall not interfere with or block either vehicular or pedestrian traffic, except when approved by the Department of Public Works. Where it becomes necessary to transport units of a wrecked building, structure or utility upon and through the public streets, alleys or other public ways and places, permission to do so shall be obtained from the Department of Public Works.

Section 3313 shall be added.

SECTION 3313
MOVING AND RELOCATION OF STRUCTURES

Section 3313.1 Scope. Buildings, structures or utilities which are moved from one location to another, within or from the City, shall conform to all requirements of this Building Code. These buildings, structures or utilities shall be inspected and approved by the Agency prior to moving.

[PW] Section 3313.2 Transportation Approval. Moving of structures on the public way by the contractor shall not interfere with or block either vehicular or pedestrian traffic, except when approved by the Department of Public Works. Where it becomes necessary to transport units of a wrecked building, structure or utility upon and through the public streets, alleys or other public ways and places, permission to do so shall be obtained from the Department of Public Works. As required by Public Works the Contractor shall submit to the Manager of Public Works an indemnity bond in the amount determined by the Manager in a form approved by the City Attorney.

[PW] Section 3313.3 Moving on the Public Way. Moving on the public right of way shall follow Public Works regulations.

Section 3313.4 Storage of Moved Buildings. Buildings, structures or utilities shall not be stored on any property for more than 72 hours, unless approved by the Agency.

Section 3313.5 Vacated lot. Reference Section 3303.4.

CHAPTER 34
EXISTING STRUCTURES

[EB] SECTION 3401
GENERAL

Section 3401.1 is replaced in its entirety with the following:

3401.1 Scope. The provisions of this Chapter and Section 1027 of the Fire Code shall control the alteration, repair, addition and change of occupancy of existing structures.

Exception:

Existing bleachers, grandstands and folding and telescopic seating shall comply with ICC 300-02.

The phrases “change of occupancy” and “change of use” are interchangeable.

Section 3404.3 is replaced in its entirety with the following:

Section 3404.3. The fire escape shall be designed to support a live load of 100 pounds per square foot (4788 Pa) and shall be constructed of noncombustible materials.

[EB] SECTION 3406
CHANGE OF OCCUPANCY

Section 3406.3 is amended by adding the following paragraph:

Stairways constructed prior to the adoption of the 2004 Denver Building Code using the provision of prior Denver Building Codes allowing " A flight of stairs shall not have a vertical rise greater than 13 feet (3963 mm) between floor levels or landings" may continue to utilize this provision and shall not be required to meet present code for the rise between floor levels or landings.

SECTION 3410
COMPLIANCE ALTERNATIVES

Section 3410 Compliance Alternatives shall be used in its entirety except as amended below:

Section 3410.2 Applicability. For the design and analysis of structural systems and elements, all buildings and structures designed under building codes in force prior to September 1976, in which there is work involving additions, alterations, or changes of occupancy, shall be made to conform to any one of the following, in its entirety:

The requirements of this section or the provisions of Sections 3403 through 3407.

The requirements of the 1997 Uniform Code for Building Conservation.

The requirements of the 2006 International Existing Building Code.

For the design and analysis of structural systems and elements, all buildings and structures designed under building codes in force subsequent to September 1976, in which there is work involving additions, alterations, or changes of occupancy, shall be made to conform to the requirements of the 2006 International Existing Building Code.

The provisions in Sections 3410.2.1 through 3410.2.5 shall apply to existing occupancies that shall continue to be, or are proposed to be, in Groups A, B, E, F, M, R, S, and U. These provisions shall not apply to buildings with occupancies in Groups H or I.

Section 3410.4.1 Structural Analysis. The owner shall have a structural analysis of the existing building made to determine the adequacy of structural systems for the proposed alteration, addition or change of occupancy. The

existing building shall be capable of supporting the minimum load requirements of Chapter 16. For seismic loads, FEMA 273, ASCE 31, or FEMA 356, may be used in lieu of Chapter 16 requirements.

CHAPTER 61
REHABILITATION OF EXISTING BUILDING

SECTION 6101
GENERAL

Section 6101.1 Scope. This Chapter applies to the rehabilitation of all existing buildings, structures and utilities of any occupancy classification, except Group H Occupancy, which is at least 30 years old. This Chapter shall supersede all the requirements of this Code that are in conflict with the provisions of this Chapter, except the requirements of Chapter 1 relating to unsafe buildings, structures or utilities.

Section 6101.2 Intent. The intent of this Chapter of the Code is to allow for cost-effective and efficient renovation of existing buildings that are at least 30 years old which may not meet the strict letter of present building and fire codes, but that still meet basic life-safety standards.

Section 6101.3 Declaration. It is hereby declared, as a matter of public policy, that the rehabilitation, preservation and restoration of older buildings, located within the City and County of Denver, are a public necessity and are required in the interest of the general welfare of the people. Special consideration shall be given to buildings that are structures for preservation or contributing structures in Districts for Preservation.

Section 6101.4 Exception for the Rehabilitation of Existing Buildings. Buildings, structures and utilities conforming with Section 6101.1 of this Code may be granted an Exception from the requirements of this Code, concerning the repair, rehabilitation or change of use or occupancy of such building, structure or utility. No Exception shall be granted unless the following conditions exist:

1. The building, structure or utility is at least 30 years old; and
2. The building, structure or utility is structurally sound and the proposed repair, rehabilitation or change of use or occupancy will substantially improve the use, safety and welfare of the occupants. The Committee or Building Official, in making this decision, may request an engineer's or architect's report to determine the condition of the building, structure or utility.

SECTION 6102
COMMITTEE

Section 6102.1 Creation. There is hereby created the Committee composed of 9 members who shall be appointed by the Mayor for terms of 2 years. The terms shall be staggered to allow for continuity. The Board members may petition to be considered for additional terms.

Section 6102.2 Composition. The Committee membership shall consist of at least one representative of the following fields:

1. Architect with broad based experience in the field of architecture.
2. Contractor possessing a Building Contractor Class A or Class B license for the City and County of Denver.
3. Fire Protection engineer or degreed code consultant.
4. Preservationist, a person with expertise in historic preservation of buildings and structures.
5. Person with expertise in real estate, real estate development or real estate financing.
6. Person with expertise in accessible design or construction to represent the Commission of People with Disabilities of the City and County of Denver.

Section 6102.2.1 Registered Professional Engineer. A registered professional engineer, with expertise in lateral stability of structures and expertise in unreinforced masonry buildings, shall be appointed to the committee to advise the committee on those subjects. This engineer shall be a non-voting member unless appointed as a voting member by the Mayor.

Section 6102.2.2 City Representation. The Building Official of this Agency and the Chief of the Fire Prevention and Investigation Division or their designees shall be ex-officio members of the Committee, but shall have no voting power. A liaison to the Mayor's Office shall be established.

Section 6102.3 Removal. The Mayor may remove any member of the Committee for cause, or when recommended by the chair. Cause may include, but is not limited to, absence from more than 3 meetings in a row.

Section 6102.4 Vacancy. The Mayor may fill any vacancy for the remaining time of the term.

SECTION 6103
COMMITTEE ACTIVITIES

Section 6103.1 Support. The Agency shall provide the Committee with a coordinator and secretary. The coordinator may be, but need not be, the Building Official of the Building Agency or his designee.

Section 6103.2 Meetings. There shall be at least one meeting per month unless there is no work for the Committee to conduct. A simple majority of the Committee shall be necessary to conduct business. Guidelines shall be established to govern the activities of the Committee. The Committee may hold meetings to inspect the physical condition of subject buildings. All meetings of the Committee shall be open to the public. At the meeting, the Committee and the applicant are encouraged to discuss the application, the requested variances and possible options and changes to the application in order to meet necessary health and safety requirements in a manner that is acceptable to all parties.

Section 6103.3 Compliance. The Committee shall make a recommendation as to any variances requested by the applicant and forward it to the Building Official. The Building Official shall grant the recommended variances within 2 weeks after receipt of the Committee's recommendation unless the Building Official determines, by clear and convincing evidence, that the variance would cause imminent peril to life or property. Such a determination must be made in writing and forwarded to the applicant and the Committee. The Chief of the Fire Prevention and Investigation Division shall provide written comments concerning the variance to the Building Official. The Building Official shall consider any such comments when making such determination and make them part of the record. Failure to comply with present codes shall not, in and of itself, constitute clear and convincing evidence of imminent peril to life or property.

Policy Recommendations: The Board may recommend policies to the Building Official for his review and approval.

Section 6103.5 Compensation. Each member of the Committee, except those that are city employees, shall be all volunteer and are not compensated.

\SECTION 6104
APPLICATION AND FEE

Section 6104.1 Application Form. Prior to any action by the Committee, an application for a variance shall be filed with the Agency on a form approved by the Committee.

Section 6104.2 Application Fee. A nonrefundable fee of $150.00 shall accompany the application. Checks shall be made payable to the Manager of Revenue.

SECTION 6105
APPLICATION REVIEW PROCEDURE

Section 6105.1 Submittal of Application. Application for a variance shall be submitted to the Building Official of the Agency by the last Wednesday of each month. The Agency shall review the application with the applicant before the first Wednesday of the next month. If the issues for a variance cannot be resolved by the first Wednesday of the month, the application shall be directed to the Rehabilitation Committee for its review and recommendation at their next meeting.

Section 6105.1 Stay of Enforcement. The application for a variance shall stay enforcement of any outstanding order or denial unless the Building Official certifies that a stay of the order or denial would cause imminent peril to life or property.

SECTION 6106
DECISION OF THE COMMITTEE

Section 6106.1 Acceptance. The decision on the application for variance shall be sent to the applicant and to the committee. Decisions shall be filed with the Clerk & Recorder as a matter of public record.

Section 6106.2 Denial by Committee. A denial of a variance by the Building Official based on a Committee recommendation for denial may be appealed to the Board of Appeals under Section 113.

Section 6106.3 Denial by the Building Official. A denial of a variance by the Building Official contrary to the recommendation of the Committee because of clear and convincing evidence that the variance would cause imminent peril to life and property may be appealed to the Manager of Community Planning and Development. Upon an appeal, the Manager of Community Planning and Development shall decide whether the Building Official has clear and convincing evidence of imminent peril to life or property with which to deny the variance. If the Manager of Community Planning and Development determines that the Building Official has met the burden of proof, the Building Official's denial of the variance shall be upheld.

Section 6106.4 Denial by Chief of Fire Prevention. A denial of a variance by the Chief of Fire Prevention and Investigation Division, contrary to the recommendation of the Committee, may be appealed to the Manager of Safety.

Section 6106.5 Period of Variance. Variance approved for the rehabilitation of existing buildings, structures and utilities pursuant to this Chapter, based on the original application, shall be valid for a period of 2 years from the date of approval, after which period the variance shall lapse and become void unless a building permit has been issued within said period and is not thereafter cancelled.

APPENDICES

APPENDIX ADOPTION STATUS

IBC APPENDICES
STATUS OF APPENDICES ON ADOPTION

All Chapters and Sections of this Appendix are adopted as part of this Code except for those that are deleted in this summary. Those that are amended or added shall also be adopted as part of this Code.

APPENDIX	TITLE	STATUS
A	Employee Qualifications	Delete
B	Board Of Appeals	Delete
C	Group U – Agricultural Buildings	Delete
D	Fire Districts	Delete
E	Supplementary Accessibility Requirements	Adopt/As Guideline
F	Rodent Proofing	Adopt
G	Flood Resistant Construction	Delete
H	Signs	Adopt As Amended
I	Patio Covers	Adopt As Amended
J	Grading	Adopt As Guideline
K	Construction In Designated Special Construction Zones	Added
L	Access Control	Added
M	Colorado Title 9 Article 5 – Standards For Accessibile Housing	Added
N	Construction Of Airport Buildings And Structures	Added

APPENDIX H

SIGNS

[Z] SECTION H101
GENERAL

[Z] Section H101.1 General is amended by adding the following sentence:

Please also see sign regulations contained in the Zoning Sign Code. Where there is a difference or conflict between the requirements in this Appendix and the Zoning Sign Code, the most restrictive shall govern.

[Z] Section H101.2 Signs Exempt From Permits is amended by adding the following to Exemptions 2 and 4:

2. Temporary signs announcing the sale or rent of property. The Zoning Sign Code Section 59-537 (a)(7) allows these signs to be erected without a permit with the following limitations: 1 sign per property; not more than 5 square feet in area per face; not more than 6 feet above grade; shall not be illuminated or animated.

4. Projecting signs not exceeding 2.5 square feet (0.23 m^2). The Zoning Sign Code Sections 59-537(c)(3) 7. & Section 59-554(d) allows projecting signs only in the B-5, B-7 & B-8-A Zone Districts. They must be reviewed and approved by the Planning Office.

[Z] SECTION H102
DEFINITIONS

[Z] Section H102.1 General is amended by adding the following:

DISPLAY SURFACE / DISPLAY FACE. The area made available by the sign structure for the purpose of displaying the message. Zoning Sign Code Section 59-2 (92).

GROUND SIGN. A sign supported by one or more uprights, poles or braces extending from the ground or an object in or on the ground but not attached to any part of any building. Zoning Sign Code Section 59-2 (133).

POLE SIGN. See Ground Sign. Zoning Sign Code defines a Pole Sign as a Ground Sign per Section 59-2 (133).

PORTABLE SIGN. A sign that is not permanently affixed to building, structure or the ground. Zoning Sign Code Section 59-2 (207)

NOTE: City Council passed Ord. No. 852-92 on 11/27/92 which added the following language to Section 59-537 (a) (6) of the Zoning Sign Code: All portable signs regardless of location are specifically not allowed.

PROJECTING SIGN. A sign or graphic, other than a wall sign, that is attached to and projects from the wall, soffit, or eave of a building, is not in the same plane as the wall, soffit, or eave to which it is attached, and identifies a use within that building. Zoning Sign Code Section 59-2 (215)

ROOF SIGN. Reference Zoning Sign Code Section 59-2 (246) Roof Sign: A sign attached to the roof of a building which sign projects above the highest point of the roof of the building or the roof of that portion of the building to which it is attached.

SIGN. Reference Zoning Sign Code Section 59-2 (269) Sign: A sign is any object or device or part thereof situated outdoors or indoors which is used to advertise or identify an object, person, institution, organization, business, product, service, event or location by any means including words, letters, figures, designs, symbols, fixtures, colors, motion illumination or projected images. Signs do not include the following:

1. Flags of nations, or an organization of nations, states and cities, fraternal, religious and civic organizations;
2. Merchandise, pictures or models of products or services incorporated in a window display;
3. Time and temperature devices not related to a product;
4. National, state, religious, fraternal, professional and civic symbols or crests;
5. Works of art which in no way identify a product.

SIGN STRUCTURE. Reference Zoning Sign Code Section 59-2 (281) Structure: Anything which is constructed or erected and the use of which requires more or less permanent location on ground or attachment to something having permanent location on ground, not, however, including wheels; an edifice or a building of any kind; any production or piece of work, artificially built up or composed of parts and joined together in some definite manner.

WALL SIGN. Reference Zoning Sign Code Section 59-2 (317) Wall Sign: A sign attached to, painted on or erected against a wall, fascia, parapet wall or pitched roof of a building or structure, and no part of which sign projects above the highest point of the roof and whose display surface is parallel to and extends not more than twenty-four (24) inches from the wall to which it is attached and extends not more than eight (8) inches from the fascia to which it is attached or, if attached to a pitched roof, the bottom of its display surface does not extend more than six (6) inches vertically from the roof surface and the top of its display surface does not extend more than forty-eight (48) inches horizontally from the roof surface.

BILLBOARD. See Outdoor General Advertising Device.

ILLUMINATED SIGN. Illuminated Sign: A sign lighted by or exposed to artificial lighting either by lights on the sign or directed towards the sign. Zoning Sign Code Section 59-2 (145)

NOTE: Illuminated Signs are not allowed to flash, blink or fluctuate.

OUTDOOR GENERAL ADVERTISING DEVICE (BILLBOARD). A Ground Sign relating to products, services or uses not on the same zone lot. Zoning Sign Code Section 59-2 (185)

APPENDIX I
PATIO COVERS

SECTION I104
STRUCTURAL PROVISIONS

Appendix I Section I104.2 is amended by replacing it in its entirety with the following:

Section I104.2 Footings. A patio cover may be supported on a concrete slab on grade without footings, provided that the slab is not less than 4 inches thick with thickened edges 12 inches below grade, and further provided that the columns do not support live and dead loads in excess of 2,000 pounds per column.

APPENDIX K
CONSTRUCTION IN DESIGNATED SPECIAL CONSTRUCTION ZONES

SECTION K101
GENERAL

Section K101 Scope. All construction, alteration, repairs, demolition or moving in areas designated under Article VII, Chapter 10 of the Revised Municipal Code as Special Construction Zones shall conform to the provisions of this Chapter.

SECTION K102
GENERAL PROVISIONS

Section K102.1 Permits. No permits for construction, alteration, repairs, demolition or moving in a designated Special Construction Zone shall be issued without being in compliance with all recommendations contained in the engineer's report if required by Section 155.

Section K102.2 Engineers reports. If the applicant is required to prepare an engineer's report pursuant to Section 155, the Department may require such additional information and recommendations as it deems necessary and may require such additional measures as are necessary to minimize potential hazards during construction and control hazards from the completed structure.

Section K102.3 Inspections. All construction and excavation sites shall be subject to inspection by the Department, Fire Department and the Department of Health and Hospitals, and results of tests or monitoring required by this Chapter shall be available at the site for inspection.

Section K102.4 Work Stoppage. In the event of a material violation with the requirements of this Chapter, the Department may stop all construction activity until it is satisfied that the violation has been corrected.

SECTION K103
HAZARDOUS GASES GENERATED BY LANDFILLS

Section K103.1 New construction. Except as provided in Section 153.6 of this Building Code, all new buildings, structures and utilities to be constructed in a Special Construction Zone, which is so designated because of the presence of hazardous gases generated by landfills, shall be designed by an engineer registered in the state of Colorado to control and

protect against accumulation of over 1.0% by volume of flammable gas in the building, structure or utility. The following precautions shall be taken during and after construction activity:

1. A flammable gas indicator shall be utilized at all times during trenching, excavating, drilling or when working within 10 feet of an open excavation.
2. When trenching, excavating or drilling deeper than 2 feet into the soil or fill, or in the presence of detectable concentrations of 1.0% by volume of flammable gas, the operating equipment shall be provided with spark proof exhausts.
3. A dry chemical fire extinguisher, approved by the Fire Department, shall be provided on all equipment used in the landfill.
4. Personnel within or near an open trench or drill hole deeper than 2 feet into the soil or fill shall be fully clothed, wear shoes with nonmetallic soles and wear a hard hat and safety goggles or glasses.
5. Exhaust blowers shall be used in instances where trenches may show a build-up of flammable gas of 1.0% by volume or less than 19.5% by volume of oxygen.
6. Smoking and/or an open flame shall not be permitted in any area within 100 feet of the excavation.
7. Personnel shall be kept upwind of any open trench unless the trench and the downwind atmosphere are continuously monitored.
8. Before personnel are permitted to enter an open trench, the trench shall be monitored for flammable gas and at least a 19.5%-by-volume oxygen sufficiency. When in the excavation, each work party shall be working no more than 5 feet from a continuously operating flammable gas and oxygen monitor.
9. The applicant shall employ an inspector whose duty it shall be to effect continuous compliance with the foregoing precautions. The inspector shall be a qualified person approved by the Department or shall be an engineer registered with the state of Colorado or a person in the employ of, or subject to, the direct supervision and control of such an engineer. Said inspector shall submit a written report of his inspection to the applicant and to the Department at 10-day intervals during active construction stating that all new construction is in compliance with these regulations, and that all testing and monitoring has been and is being done as required by the Code.
10. After construction is completed, hazardous gas monitoring devices approved by the Fire Department shall be installed in the completed building or structure in such number and in such places within the building or structure as may be required by the Fire Department.

Section K103.2 Alteration or Repair of Existing Building, Structures or Utilities. Except as provided in Section 153.6 and K 103.3, no alterations or repairs to any existing building, structure or utility shall be made unless the following precautions are taken:

1. Within 5 days prior to applying for a permit under Chapter 1 of the Building Code to alter or repair an existing building, structure or utility, the work site shall be tested for the presence of flammable gas by an engineer registered in the state of Colorado.
2. The applicant shall be exempt from all other requirements of this Section K103.2 if:
    1. Test results show that there is less than 2.0% of the Lower Explosive Limit (L.E.L.) of hazardous gas, then the permit for the work shall be issued; and
    2. Upon completion of the work, the applicant shall install hazardous gas monitoring devices approved by the Fire Department in such number and in such places within the building or structure as may be required by the Fire Department.
3. If the test results show that there is 2% or more of the Lower Explosive Limit (L.E.L.) of hazardous gas, then the applicant shall take all of the precautions pursuant to Section K 103.1 as if the construction were new construction.

Section K103.3 Exemption. Whether or not he is an applicant for a permit, the owner of real property within a Special Construction Zone may apply to the Building Agency for a certificate of exemption from the provisions of Article 647 of the Revised Municipal Code and Section K 103 of the Building Code. To obtain such exemption, said owner shall have his property tested by an engineer registered in the state of Colorado and tests shall meet the following requirements:

1. A test for the presence of flammable gas shall be performed at a time when there is frost on his property to a depth of at least 6 inches in the soil, again at a time when there is no frost in the soil, and again within 5 days of the date when an exemption certificate is applied for.
2. The test holes shall be placed along each major boundary line of the real property for which the exemption is sought in such number and at such locations as the engineer deems proper.
3. If the test results show that there is less than 2.0% of the lower explosive limit (L.E.L.) of flammable gas, and if such test results are satisfactory to the Department, then the Department shall issue a certificate stating that the real property described in the certificate is exempt from the provisions of Article 647 of the Revised Municipal Code and Section K 103 of the Building Code.
4. As a condition of receiving an exemption certificate from the Department, the owner shall acquire and install in all existing and future buildings and structures devices approved by the Fire Department to monitor for the presence of hazardous gas in such number and in such places within the building or structure as may be required by the Fire Department.
5. Upon a finding that flammable gas is present in amounts greater than 2% of the lower explosive limit on any property where an exemption certificate has been issued, the Department shall revoke the exemption certificate. Further, upon a finding that the monitoring devices on any property for which an exemption certificate has been issued are inoperative, the Department may suspend or revoke the exemption certificate.

APPENDIX L
ACCESS CONTROL

SECTION L101
INTRODUCTION

L101.1 Background. Since 1990 various written policies have been implemented and applied to establish requirements and guidelines for the assessment and permitting of access control systems. Initially, policies were written to address the needs that had developed for securing the elevator lobby and stair enclosures in high rise buildings. As the use of these systems increased, and as they became more complex, it was necessary to develop a more comprehensive policy to address these systems that were being used in ever increasing applications. The development of an expanded policy was also driven by the failure of the model building code to respond to the increasing security needs in buildings. The model building code did not provide a reasonable balance between life safety concerns and security needs. Further, these systems were found to have a detrimental effect on exiting, fire department access and accessibility as well as reducing the effectiveness of other life-safety features in buildings. In order to address this need for a more comprehensive policy, an Access Control Committee was established to develop the required document. The committee was composed of both private and public sector members. On April 18, 1995 the Building Inspection Division began to apply the initial policy developed by this committee. The policy was published as Policy Number 32-B068. Since being implemented, the original policy was continuously applied and used as the basis for the review and acceptance of access control systems. In the year 2000, the Access Control Committee was re-established and began to meet to develop an updated and expanded version of the 1995 policy. This committee developed an updated policy but that new version was not implemented pending the adoption of the IBC (International Building Code) as the Building Code for the City & County of Denver.

The DBC includes a number of provisions that relate to access control systems that are similar to some of the systems and requirements of the new version of the access control policy. However, these provisions are not as comprehensive as those contained in this policy. In order to codify the policy and to provide a more consolidated and organized approach to access control it was decided to develop a separate appendix in the building code for access control systems. The newest version of the access control policy was used as the basis for this appendix. The provisions of the International Building Code that address issues related to access control systems are deleted in the Denver Amendments to the IBC and reference is made to this appendix for the appropriate corresponding requirements

L101.2 Purpose and intent. The purpose of this appendix is to combine all of the various DBC requirements and previous policy requirements for access control systems into one document. The appendix is intended to provide

consistency in the design, review, installation and inspection of access control systems and components by providing standards and guidelines for these systems. It is anticipated that redundant design efforts and administrative modification requests can be avoided by providing safe alternative solutions to some commonly reoccurring security applications where the use of access control systems would create conflicts with other requirements of the DBC. Although the appendix contains specific solutions for a number of common applications it is not intended to limit the use of this policy to only those situations. This appendix can be used to help devise appropriate solutions to other unique situations that require the use of access control systems that may also be incompatible with requirements of the DBC. The provisions of the DBC in Section 103.3 relating to modifications under special circumstances can be used when other solutions provide an equivalent alternative to the provisions of the DBC. The standards and guidelines of this appendix are designed to assist in the development of specialized access control systems that are necessary to respond to unique security needs.

L101.3 Prevailing policy. All access control policies previously applied by Community Planning and Development are null and void and superceded by this appendix. These policies include but are not limited to the following policies:

Policy P-25	Securing of Stair Doors Into Exit Enclosures – Dated 09/04/1999
Policy P-26	Securing of Elevator Lobbies - Dated 02/05/1993
Policy P-47	Interim Policy – Electric Door Hardware Applications for Exit Doors - Dated 09/21/1992
Policy 32-B068	Access Control – Dated 04/18/1995

The provisions of this policy are not intended to be applied to existing access control systems that were permitted and legally installed in accordance with the provisions of the DBC and any Access Control Policy in effect at the time the permit was issued.

L101.4 Modified IBC provisions. The following IBC sections have been modified and are superceded by the provisions of this appendix:

Section 403.12 Stairway door operation.

Section 1008.1.3.4 Access-controlled egress doors.

Section 1008.1.8.6 Delayed egress locks.

Section 1008.1.8.7 Stairway doors.

SECTION L102
DEFINITIONS

L102.1 Definitions. The following words and terms shall, for the purposes of this appendix, have the meaning shown herein.

ADBC. Administration of the Denver Building Code. Contains the amendments that have been adopted for the administration of the Denver Building Code. Adopted with the Denver Building Code Amendments.

ACCESS CONTROL SYSTEM. A group of devices including control unit(s), electric hardware, wiring and raceways electrically interconnected to control and regulate ingress and egress.

ACCESS CONTROL SYSTEM CONTRACTOR. A contractor licensed to install, add to, alter or repair control units, electric hardware, wiring and raceways electrically interconnected to control and regulate ingress and egress. Voltages shall not exceed 48 volts or the system shall be power-limited as defined by the NEC. All work shall be performed under the supervision of the holder of an Access Control System Supervisors Certificate.

ACCESS CONTROL SYSTEM UNIT. The component(s) of an access control system that provide system logic and control (e.g., reader electronic panels, stand-alone keypads, telephone entry controllers, burglar alarm system units with access control capability, intercom controllers and door entry buzzers or buttons.)

APPROVED. Approved as to materials and types of construction, as determined by the Building Official following investigation and tests conducted by him, or by reason of accepted principles or tests by recognized authorities, technical or scientific organizations.

CABINET. An enclosure with a hinged or screw lid used primarily to provide a degree of protection against incidental contact.

CONTACT SENSE EXIT DEVICE. Door mounted hardware designed to electrically sense the touch or immediate presence of an occupant moving to open the door. Depends upon the "touch" sensor to initiate a door unlock as opposed to more traditional door hardware that depends upon mechanical movement of the hardware to unlock the door.

CPD. Community Planning & Development (formerly the Building Inspection Division).

DBC. Denver Building Code. The International Codes as currently adopted including the provisions found in the City and County of Denver Amendments to the Denver Building Code and the Adminstration of the Denver Building Code.

DBCA. The Denver Building Code Amendments. Also includes the provisions of the Administration of the Denver Building Code.

DFC. Denver Fire Code. The IFC as currently adopted including the City and County of Denver amendments.

DIRECTLY UNLOCK. To directly interrupt power to the locking device, independent of the operation, functionality or programming of access control system units.

ELECTRIC BOLT. Dead-bolt type of lock that is electrically operated and is dependent upon power to either project or withdraw the bolt.

ELECTRIC HARDWARE. Any door hardware or accessory product that is used in a circuit as a conductor, load, power supply or switch.

ELECTRIC STRIKE. Lock strike that is modified to release the latch bolt with the application or removal of electric power.

ELECTRIC LOCK. Any locking or latching door hardware that relies on electrical energy for its operation.

ELECTRICAL CONTRACTOR. Colorado State licensed electrical contractor.

ELECTRICAL SIGNAL CONTRACTOR. A contractor licensed to install, add to, alter or repair electrical wiring and equipment for fire alarm, fire detection, emergency voice communication systems, electrical signaling and control wiring. Voltages shall not exceed 48 volts or the system shall be power-limited as defined by the NEC. All work shall be performed under the supervision of the holder of an Electrical Signal Supervisor Certificate.

ELECTRICALLY MODIFIED LOCKSET. A standard builder's hardware lockset that has been modified to operate electrically without compromising mechanical free egress.

ELECTRICALLY OPERATED EXIT DEVICE. An exit device that has been modified to operate electrically without compromising mechanical free egress.

ELECTRIC LOCKS – MASTER SWITCH. An electrical switch configured to immediately and simultaneously unlock all connected door locks (typically, but not limited to delayed egress doors, secured elevator lobby doors and stair tower doors). The switch shall be located in the building's Fire Command Center or other approved location. The switch shall be a two-position, toggle switch labeled "ELECTRIC LOCKS" with its positions labeled "LOCKED" and "UNLOCKED". When located in a non-secure area, a two-position, key operated switch may be used when a matching key is located in the building's Key Lock Box

FAIL-SAFE LOCK. A lock that unlocks automatically upon loss of power.

FAIL-SECURE LOCK. A lock that remains locked during loss of power.

FIRE ASSEMBLY. An assembly of fire doors, fire windows or fire damper, including all required hardware, anchorage, frames and sills.

FIRE DETECTION SYSTEM. A building that is fully smoke detectored, or smoke detection where required by the DBC Section 1807, Smoke Control in High Rise Buildings.

FPB. Fire Prevention and Investigation Division, of the Denver Fire Department.

LABEL. Fire doors shall have a label or other identification showing the fire protection rating. Such label shall be approved and shall be permanently affixed. The label shall be applied at the factory where fabrication and assembly are performed. Inspection shall be made by an approved inspection agency during fabrication and assembly.

LISTED and LISTING. Terms referring to equipment and materials which are shown in a list published by an approved testing agency, qualified and equipped for experimental testing and maintaining an adequate periodic inspection of current productions and whose listing states that the equipment complies with recognized safety standards.

MAGNETIC LOCK. Lock that relies on magnetic power to lock the door, typically mating a door mounted door-plate to a frame mounted lock housing.

MANUAL UNLOCKING SWITCH. A permanently wired, manually operated, raised, push-type switch with integrated time delay which immediately and directly unlocks a door.

MECHANICAL FREE EGRESS. Door hardware that mechanically unlocks and unlatches the door, from the inside (egress side) with a single motion without the use of a key, card or any special knowledge or effort.

MOTION DETECTOR. A device that is listed by an approved testing laboratory as a request to exit sensor.

NEC. National Electric Code.

POWER TRANSFER. Hinge, pivot or door cord that provides routing for the wire to pass from the frame into the door.

SHEAR-TYPE MAGNETIC LOCK. A magnetic lock that relies on a shear pin, post, concave/convex machining or other similar projections to enhance the latching strength of the lock.

SECTION L103
GENERAL REQUIREMENTS

L103.1 General Requirements. All access control system applications shall comply with all of the requirements contained in Section L103 unless other specific provisions of Appendix L modify these requirements.

L103.1.1 Mechanical Free Egress. All doors shall have mechanical free egress at all times unless otherwise approved by CPD.

L103.1.2 Fire-Rated Doors. Required fired-rated doors shall remain latched at all times that the door is in a closed position.

L103.1.3 Modifying Doors and Door Frames. Re-machining fire-rated doors or frames may void the fire label. Re-machining shall comply with the manufacturer's specified procedures.

L103.1.4 Key Lock Boxes. Provision for ingress by way of an approved key box (e.g., "Knox Box") for entry by emergency personnel should be provided and shall be located in a FPB-approved location.

L103.1.5 Fail Safe Wiring. When electric locks are held locked by the application of electric power, the wiring between the power supply and lock shall be installed in a "fail-safe" arrangement. All portions of the circuit shall be configured in a way that parallel conductors in a common cable or raceway shall have conductors of opposite polarity in the same cable or raceway. This arrangement assures that the lock releases if wires break or if parallel conductors are shorted.

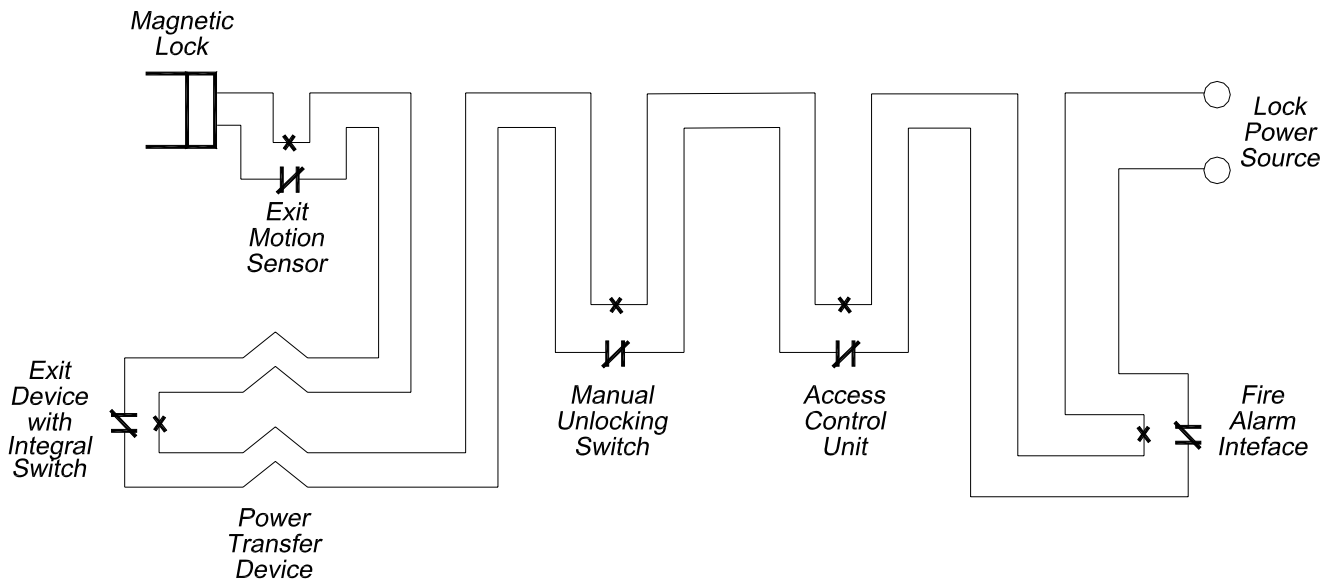


FIGURE 103.1.5

L103.1.6 Access Control System Power. Access control system power supplies shall comply with all of the following requirements:

"Plug-in" Class II power supplies along with their serving outlets shall be enclosed in a protective cabinet.

All power supplies other than "plug-in" Class II power supplies shall be hardwired to primary power.

When the manufacturer's nameplate primary power requirement exceeds 180 volt-amps, the power supply shall be served by a dedicated branch circuit. If power requirement is less than 180 VA, then an existing power outlet may be converted to a junction box serving the power supply.

Fine Print Note (FPN): This section is not intended to preclude the use of emerging technologies such as Power Over Ethernet "POE" solutions. It is the intent that power supplies be appropriately listed and that they be reasonably protected against unintentional disconnect. A reasonable accommodation for POE solutions may be for the POE hardware to be located in a secure wiring closet.

L103.1.7 Hardware Requirements. All access control system applications shall utilize hardware that complies with all of the requirements contained in Section L103.1.7 unless specifically excepted by other provisions of Appendix L.

L103.1.7.1 Listing. All access control system units shall be listed for their intended use by an approved agency, such as UL or ETL, or as otherwise approved by CPD.

L103.1.7.2 Electrical Compatibility. All components of the operating system shall be matched electrically in all ratings (i.e. voltage and current).

L103.1.7.3 Electric Strikes. Doors or frames may be equipped with electric strikes that do not affect mechanical free egress. Electric strikes used on fire-rated doors shall be fail-secure and shall bear the appropriate fire listing.

L103.1.7.4 Electrified Locksets. Approved and listed electrically modified locksets (mortise, cylindrical or unit type) that do not affect mechanical free egress are permitted.

L103.1.7.5 Electrically Operated Panic Hardware. Approved and listed electrically operated panic hardware (rim, mortise, and concealed or vertical rod type) is permitted. The exit device shall bear appropriate fire rating when used on fire-rated doors.

L103.1.7.6 Electric Bolts. Electric bolts, either flush or surface mounted, shall not be installed, altered or repaired.

L103.1.7.7 Shear-Type Magnetic Locks. Shear-type magnetic locks shall not be installed, altered or repaired.

L103.1.7.8 Non-Binding Hardware. Hardware shall be non-binding in design and function.

SECTION L104
ACCESS CONTROL SYSTEMS WITH MAGNETIC LOCKS

Section L104.1. Access Control Systems with Magnetic Locks. Doors in all occupancies except H occupancies are permitted to be equipped with magnetic locks that prevent mechanical free egress when the magnetic locking system complies with all of the provisions of Section L104. Magnetic locks that are part of a delayed egress system shall comply with the provisions of Section L105.. Magnetic locks that are used to secure an elevator lobby shall comply with all of the requirements of Section L106.

L104.1.1 Fire alarm interface. Activation of the building fire alarm system, automatic sprinkler system or fire detection system, if provided, shall directly unlock the doors, and the doors shall remain unlocked until the system has been reset.

L104.1.2 Loss of power. Loss of power to that part of the access control system which locks the doors shall automatically unlock the doors.

L104.1.3 Magnetic lock power transfer. Power transfer from the door to the frame shall be listed and approved.

L104.1.4 Other locking devices. When magnetic locks are installed on a door, no other locking device shall be used on the door that prevents free egress.

L104.1.5 Door release hardware. The door shall unlock from the egress side using a combination of any two of the following means:

Door mounted release device. May be either of the following:

Panic hardware release. Panic hardware may be used to unlock a magnetic lock, provided it is equipped with an internally mounted switch. Operation of the panic device shall simultaneously directly unlock the magnetic lock and allow the door to open with one motion. The switch shall have a proven operable life, as part of the exit device, equal to the listing requirements for the device (typically 250,000 cycles).

Contact sense exit device release. This device shall directly unlock the magnetic lock.

Manual unlocking device. A manual, press to operate button may be used to unlock a magnetic lock when all the following conditions are met:

Be located in compliance with the requirements of ICC/ANSI A117.1-2003 section308.

Be located within five feet of either edge of the egress side of the door opening.

The operable portion of the device shall have a minimum dimension of one inch (1”).

Be clearly identified by a sign that reads “EXIT” (or similar language) in minimum ¼” high letters on a contrasting background.

Directly unlock the magnetic lock.

Remain unlocked for a minimum of 30 seconds.

Motion Detector Release. The detector shall be arranged to detect an occupant approaching the doors from the egress side within a six-foot radius of the centerline of the door opening (refer to Figure 104.1 for coverage patterns) and upon detection, shall directly unlock the magnetic lock and shall keep it unlocked for a minimum of 5 seconds. Loss of operating power to the detector shall directly unlock the magnetic lock.

COVERAGE PATTERNS

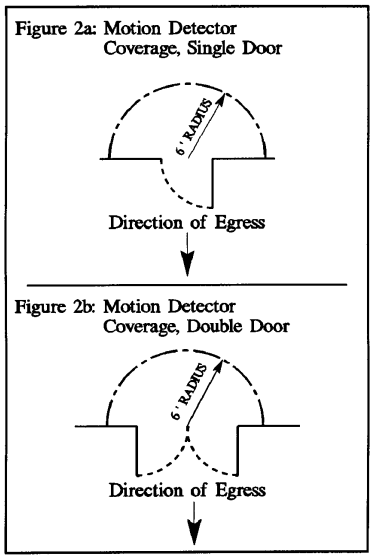


FIGURE 104.1

SECTION L105
DELAYED EGRESS SYSTEMS

L105.1 Delayed Egress Locks. Approved, listed, delayed egress locks shall be permitted to be installed on doors serving any occupancy except Group A, E and H occupancies in buildings that are equipped throughout with an automatic sprinkler system in accordance with IBC Section 903.3.1.1 or an approved automatic smoke or heat detection system installed in accordance with DBCA Section 907 as amended, provided that the doors unlock in accordance with Items 1 through 7 below. A building occupant shall not be required to pass through more than one door equipped with a delayed egress lock before entering an exit.

The doors unlock upon actuation of the automatic sprinkler system or automatic fire detection system.

The doors unlock upon loss of power controlling the lock or lock mechanism.

The doors unlock when the Electric Locks, Master Switch is in the unlocked position.

A release device shall initiate an irreversible process that shall unlock the door within a delay period of not more than 15 seconds. The maximum required force and time to activate the release device shall not exceed 15 pounds (67 N) for 1 second. Initiation of the irreversible process shall activate an audible signal in the vicinity of the door. Once the door is unlocked by the application of force to the releasing device, relocking shall be by manual means only, at the door.

Exception:

Where approved, a delay period of not more than 30 seconds is permitted.

A sign shall be provided on the door located above and within 12 inches (305 mm) of the release device reading: PUSH UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 (30) SECONDS.

Emergency lighting shall be provided at the door.

The components for the delayed egress lock shall be listed as a complete assembly. Individual, listed components may not be field assembled to build a delayed egress locking assembly.

SECTION L106
SECURING AN ELEVATOR LOBBY WITH AN ACCESS CONTROL SYSTEM

L106.1 Secured Elevator Lobby. When all of the provisions of Section L106.1 have been satisfied, elevator lobbies may be secured to prevent access from the elevator lobby into a tenant space.

L106.1.1 Use of Secured Elevator Lobbies. Secured elevator lobbies are intended to provide a transitional area where building occupants can await the arrival of an elevator car or depart from an elevator car. It is not intended to be an area where building occupants can work. A secured elevator lobby cannot contain other spaces that are considered normally occupied such as restrooms, reception areas or waiting areas.

L106.1.2 Exit Path Blockage. Securing of the lobby cannot result in the blockage of exit paths from normally occupied areas. A secured lobby cannot interrupt the exit path circulation.

L106.1.3 Dead-End Corridors. Securing of the lobby cannot result in dead-end exit corridors with lengths that exceed the provisions of IBC Section 1017.

L106.1.4 Restroom Facility Access. Securing of the lobby cannot result in elimination of access to required restroom facilities from normally occupied areas. Each individual tenant shall have access at all times to required toilet facilities.

L106.1.5 Electric Load-Center Access. Securing of the lobby cannot eliminate the access required by the NEC to electrical overload protection or disconnect equipment. Each tenant shall have the access required by the NEC.

L106.1.6 Delayed Egress. Delayed egress hardware is permitted under this section.

L106.1.7 Exit Stairway Access. Elevator lobbies shall have at least one means of egress complying with Chapter 10 and other provisions within this code.

Exception:

An elevator lobby may be secured provided all of the following conditions are met:

Fire System Requirements. The building shall be equipped with either a fire alarm system and be fully detectored or be fully sprinkled and have manual fire alarm boxes (pull stations) installed throughout the building or be equipped with the life-safety features prescribed under IBC Section 403.

Electric Locks. All doors connecting the secured lobby with normally occupied areas or with corridors leading to the exit stair enclosure can only be secured with a fail-safe electric lock. The lock shall unlock when the fire alarm is activated.

Emergency Communications. One of the following emergency communication devices shall be provided in the lobby:

A manual fire alarm box shall be installed in a clearly visible location within the elevator lobby and mounted at a height to comply with the Reach Ranges provisions of ICC/ANSI A117.1 (2003) Section 308. The location shall be subject to approval by the FPB. A manual fire alarm box installed under these requirements shall transmit to a Class I Central Station.

An emergency telephone or other approved two-way communication device shall be installed in the elevator lobby, and mounted in compliance with the Reach Ranges provisions of ICC/ANSI A117.1 (2003) Section 308. The location shall be approved by the FPB. The system/device shall transmit to a commercial monitoring service or continuously staffed monitoring service within the building as approved by CPD and the FPB. Upon activation, the communications device shall automatically transmit a location identification message to the monitoring service. A sign shall be provided at the communication device that states that this is an emergency phone and lists the building address and the floor number of the elevator lobby.

Lighting Requirements. The elevator lobby shall be illuminated per IBC Section 1006 (Means of Egress Illumination).

Compatibility With Accessibility Requirements. All doors into the elevator lobby area from normally occupied areas shall have accessible hardware compatible with the requirements of ICC/ANSI A117.1 (2003) Sections 308 and 404.2.6 on each side of the door.

Areas of Evacuation Assistance (Refuge Areas). When an elevator lobby is used as an Area of Evacuation Assistance, all of the following additional, conditions shall be met:

Electric Lock Requirements. Electric locks shall be designed so that when they are released, the door will remain latched. The lock shall also be connected to the Electric Locks – Master Switch.

Door and Door Hardware Requirements. All doors opening into elevator lobby refuge areas shall be 20-minute fire-protection rated assemblies as required by DBC Section 403.9.1. All hardware necessary to maintain the fire rating of the door shall be listed and approved fire door hardware. All hardware installed on the rated door and frame assembly shall be compatible with the manner in which the door was manufactured and shall not reduce the fire rating of the assembly. Field or other modification of rated doors and frames is prohibited unless approved in writing by the agency which labeled the fire-rated assembly.

Securing Doors Leading Into the Elevator Lobby. Doors leading into the lobby refuge area from normally occupied areas shall be readily openable from the normally occupied side without the use of a key or special knowledge or effort.

Refuge Area Subdivision. A refuge area, which includes the elevator lobby and the corridors that connect the lobby to the exit stair enclosures, shall remain as one open area without restriction of movement within the refuge area.

SECTION L107
SECURING EXIT ENCLOSURE (STAIR TOWER) DOORS

Section L107.1 Securing Exit Enclosure Doors. Doors opening into exit enclosures can be secured under certain conditions provided all of the applicable requirements of Section L107.1 are satisfied.

Section L107.1.1 Exit Enclosure Door General Hardware Requirements. All doors into exit enclosure shall have hardware that complies with the provisions of Section L107.1.1

Section L107.1.1.1 Fire Rating and Latching Requirements of Door Hardware. All doors into exit enclosures shall be fire-rated assemblies, as required by IBC Section 1020. In order to maintain the fire rating of the door assembly, all hardware installed on enclosure doors shall meet the following criteria:

Latching Requirements. The door shall remain latched at all times that the door is in a closed position as required by IBC Section 715.4.7.1. Electric locks or strikes that unlatch the door upon activation of the fire alarm system or loss of power are unacceptable.

Hardware Requirements. All hardware shall be listed for use on fire-rated door assemblies. The hardware shall be listed for an hourly rating equal to or greater than the rating of the door assembly. Any field or other modification of rated doors and frames is prohibited unless approved in writing by that agency that labels the door and frame assembly. Doors that are modified to accommodate hardware without the approval of the labeling agency are not approved and shall be replaced with properly labeled doors manufactured to accommodate the hardware.

L701.1.1.2 Door Hardware Requirements to Provide Accessibility. All new hardware on doors into exit enclosures shall be compatible with the requirements of ICC/ANSI 117.1 (2003) Sections 308 and 404.2.6. All hardware that was installed after August 1, 1983, shall comply with ICC/ANSI 117.1 (2003) Sections 308 and 404.2.6.

L107.1.2 Requirements for Access Control. All doors into exit enclosures shall be capable of being opened from both sides without the use of a key or special knowledge or effort unless otherwise permitted by the provisions of Section L107.1.

L107.1.3 Exit Enclosure Doors at the Exit Discharge Level. Doors providing the path of egress out of the enclosure at the discharge level cannot be locked from the exit enclosure side at any time.

Exception:

Magnetic locks and Delayed Egress Locks are permitted when used in accordance with this appendix.

Exterior exit enclosure doors at the exit discharge level can be locked to prevent access into the exit enclosure from the exterior side. Interior exit enclosure doors at the exit discharge level that are not intended for exit discharge from the exit enclosure shall comply with all of the provisions of Section L107.1.4.

L107.1.4 Access Doors Into Exit Enclosures at Levels Other Than the Exit Discharge Level. Doors that are a part of the path of egress into exit enclosures cannot be locked to prevent or restrict access into the exit enclosure at any time. Doors shall be operable without the use of a key or any special knowledge or effort. The door shall be capable of being opened with one operation only. The following types of locking devices are prohibited on the exit side of doors into enclosures:

Key operated mechanical locks. Mechanical locks requiring a key, combination or other special knowledge to open the door.

Combination of mechanical and electrical locks. Combinations of mechanical door hardware and/or electric locks which require more than one operation to open the door.

Electric locks. Electric locking devices which are unlocked by use of a key, card reader, key pad, pressure sensitive mat, push button switch or other similar method.

Electric strikes. Fail-safe electric strikes are prohibited on doors into exit enclosures. The latch point on these doors must be maintained and a fail-safe electric strike does not maintain the latch point when power is lost to the strike. Fail-secure electric strikes that are not listed for use on a fire rated door assembly are also prohibited on doors into exit enclosures. Except as allowed by Section L107.1.3.2.2.

After hours locks. Locking devices that are activated after normal business hours or during other timed periods and restrict access into the exit enclosure.

Exceptions:

Magnetic locks and Delayed Egress locks are permitted when used in accordance with this appendix.

Parking Garage. In a parking garage that is not intended for use by the general public (or in other garages, when approved by CPD & FPB), doors used in a means of egress that also serve lobbies, corridors or common areas may be locked provided all of the following conditions are met:

Parking Garage, Lobby, Corridor, Common Area Use. The parking garage, lobby, corridor or common area that is accessed by the door may not be accessible to the general public.

Fire System Requirements. The building shall be equipped with a fire alarm system with manual fire pull stations and notification appliances installed throughout the building. Manual pull stations and notification appliances shall be provided adjacent to each secured, parking garage door. If the building is provided with an automatic sprinkler system or a fire detection system then activation of either of these systems or the fire alarm system shall unlock the doors and the doors shall remain unlocked until the system has been reset.

Electric Lock Requirements. The electric lock must be fail-safe and unlock upon fire alarm activation or loss of normal building power. The lock may not be connected to an emergency power source that would keep the lock energized when normal building power is lost.

Signage. A sign shall be provided on the garage side of each door to be locked that reads: DOOR IS LOCKED, UNLOCKS UPON FIRE ALARM. The sign shall be in letters 1 inch (25 mm) high on a contrasting background.

Lighting. The area at the door shall be illuminated per IBC Section 1006 (Means of Egress Illumination).

L107.1.5 Doors That Provide Access Out of Exit Enclosures at Non-Discharge Levels. If the locking system complies with all of the specific provisions of Section L107.1.5 and the general provisions of Section L107.1 then the doors that provide access out of exit enclosures on levels that are not intended for exit discharge may be secured from the exit enclosure side.

L107.1.5.1 High Rise Buildings. In a high rise building, if all of the provisions of this section are satisfied then the enclosure doors can be locked to prevent access out of enclosure on all levels except the exit discharge levels.

L107.1.5.1.1 New Door Locks Which Prevent Access Out of Exit Enclosures. All new lock installations in high rise buildings, which prevent access out of an exit enclosure, shall satisfy the following requirements:

Electric Locks. All new locks shall be electrically modified locksets which shall simultaneously unlock, but not unlatch, upon a fire alarm or a power loss or activation of Electric Locks – Master Switch. The electrically modified lockset shall be wired to all three of these monitor/power/control points. Each of these three conditions shall unlock but not unlatch the stairway doors. These locks shall not be connected to an emergency power source that would keep the door locked upon loss of normal building power.

Mechanical Locks. Conventional keyed, combination or other mechanical locks are not allowed in new lock installations

Fifth Floor Rule. Where doors are locked for more than five consecutive floors, a telephone or other approved two-way communication system shall be provided. The travel distance between each phone or communication system shall not exceed five floors as required by IBC Section 403.12.1.

Phone/Communications System. An emergency telephone or other approved two-way communication device shall be installed in the stair landing, and mounted at a height to comply with the requirements of ICC/ANSI 117.1 (2003) Section 308. The location shall be approved by the CPD. The system/device shall transmit to a commercial monitoring service or continuously staffed monitoring service within the building as approved by CPD. Upon activation, the communications device shall automatically transmit a location identification message to the monitoring service.

Signage. All locked exit enclosure doors shall have the applicable signage required by Section L107.1.5.1.1 and IBC Section 1020.1.6 and comply with ICC/ANSI 117.1 (2003) Sections 703 and 704. Signage shall be provided as follows:

All doors that are locked for more than 5 consecutive floors shall have a sign that reads: **THIS DOOR IS LOCKED. EMERGENCY PHONES ARE LOCATED ON FLOORS ___ AND ___.**

All doors that are locked for 5 consecutive floors or less shall have a sign that reads: **THIS DOOR IS LOCKED. FOR THE NEXT UNLOCKED DOOR GO DOWN TO FLOOR ___ OR UP TO FLOOR ___.**

All emergency phones in exit enclosures shall have a sign that reads: **EMERGENCY PHONE.** The sign shall also provide the address of the building and describe the floor and stair location of the phone.

L107.1.5.1.2 Existing Door Locks Which Prevent Access Out of Exit Enclosures. Existing locking systems in high-rise buildings that prevent access out of exit enclosures shall satisfy all of the following criteria in order to remain in service:

Existing Lock Definition. An existing lock is a lock that was legally installed with a building permit prior to September 21, 1990, the effective date of Policy P-25 "Securing of Stair Doors into Exit Enclosures". The lock shall also comply with all of the requirements of the building code in effect at the time it was installed.

Master Keys. Locks must be key operable. Four sets of master keys to operate the locks shall be available for Fire Department use in a location approved by the FPB.

Fifth Floor Rule. Doors shall not be locked for more than five consecutive floors with keyed mechanical locks. Where keyed locks are in place for more than five consecutive floors, at least one shall be replaced by an electric lock such that the keyed locks do not occur for more than five consecutive levels. The electric locks shall comply with all high rise building requirements as required by Section L107.1.5.1.1.

Existing Mechanical Combination Locks. Existing mechanical combination locks shall be removed and replaced with complying electric locks.

Existing Electric Locks. Existing electric locks on the enclosure side may remain in service if they comply with all of the requirements listed in Section L107.1.

L107.1.5.2 Non-High Rise Buildings. In non-high rise buildings, if all of the provisions of Section L107.1.5.2 are satisfied then the enclosure doors can be locked to prevent access out of the enclosure on all levels except the discharge levels or other levels required to have access from the enclosure by the provisions of Section L107.1.5.2.2.

L107.1.5.2.1 Non-High Rise Buildings Less Than Five Stories. Doors into exit enclosures can be locked with any type of mechanical lock or listed electrical lock from the enclosure side to prevent access out of the enclosure if all of the following conditions are satisfied:

The locking hardware does not prevent mechanical free egress into the enclosure at exit doors.

The door is not a part of the egress path from the enclosure at a discharge level.

The door locking hardware complies with all of the requirements of Section L107.1.1.1.

If listed electric strikes are used as part of the locking system the strike shall be a fail-secure strike.

The provisions of this section can be applied to locking applications in both new and existing buildings.

L107.1.5.2.2 Non-High Rise Buildings Greater Than Four Stories. Exit enclosure doors can be locked to prevent access out of the enclosure in non-high rise buildings more than four stories in height if the locking system complies with all of the general provisions of Section L107.1 and the specific provisions for high rise buildings in Section L107.1.5.1.

SECTION L108
CONTRACTOR LICENSING REQUIREMENTS FOR ACCESS CONTROL SYSTEMS

Section L108.1 Contractor Licensing Requirements for Access Control System Work. A licensed access control contractor is required to obtain the permit necessary to install access control systems and components, including but not limited to, delayed egress systems, telephone entry systems, electric door strikes, magnetic locking hardware, electrified locksets, electrically operated panic hardware, card readers, controllers and other access control equipment. The access control contractor may perform all of the work related to the installation of the access control system except for the work restricted by the provisions of Section L108.1.2. The restricted work shall be performed by a contractor that is licensed to perform the work.

L108.1.1 Access Control System Contractor License. The access control system contractor license is authorized and classified by the provisions of DBC. All of the applicable requirements of Section 122 shall be satisfied in order to obtain the access control system contractor license. The access control contractor may perform all work directly related to the access control system except as limited by this section. The following types of related work can be performed by the access control contractor:

The installation of all access control system components including but not limited to control panels, magnetic locking hardware, electrified locksets, electric strikes, electrically operated panic hardware, card readers and power supplies that are not hardwired to the building's electrical power distribution system can be performed. The work necessary to connect the access control system to a hard-wired power supply is allowed to be performed.

The installation of all associated interconnecting wiring between access control system components necessary for operation of the system except electrical circuits that are powered with more than 48-Volt-AC/DC can be performed.

The installation of raceways and conduits that only contain wiring for the interconnection of the various access control components can be performed.

The modification of doors and door frames required to install the various access control components can be performed if the modification does not void the listing and labeling of a fire rated door and/or door frame. The work necessary for the replacement of existing doors and/or doorframes in existing openings is also allowed to be performed.

An electrical contractor or an electrical signal contractor cannot perform the work that requires an access control system contractor unless allowed by other provisions of this appendix. The modification of doors and door frames can be performed by a properly licensed building contractor (Class A or B) or by one of the Class D building specialty contractors licensed to install or perform work on doors.

L108.1.2 Requirements for Work Not Performed by Access Control Systems Contractor. Work related to the installation of the access control system that cannot be performed by the access control system contractor shall be performed by a contractor that is licensed by the classification provisions of DBC to perform the work. The following

types of work related to the installation of access control systems cannot be performed by the access control contractor and shall be performed by an appropriately licensed contractor as required by Section L108.1.2:

The wiring and modifications necessary to connect the access control systems to the fire alarm system. This work shall be performed by an electrical signal contractor or an electrical registration contractor (Section 123.1, #9).

The wiring and modifications necessary to connect the access control system to elevator control system. This work shall be performed by a licensed elevator contractor.

Any work on electrical circuits that are powered by more than 48 Volt-AC/DC including the hard-wiring of power supplies for the access control system to the building's power system. This work shall be performed by an electrical registration contractor.

The installation of conduits or raceways that are intended to contain wiring for any of the following types of circuits is not allowed:

Circuits that carry more than 48 Volts AC/DC. This work shall be performed by an electrical registration contractor.

Circuits that are a part of the building's fire alarm system. This work shall be performed by an electrical signal contractor or an electrical registration contractor.

Circuits that are a part of an elevator control system. This work shall be performed by an elevator contractor.

The construction of new walls and the installation of new doors and/or door frames in new openings. This work shall be performed by a Class A building contractor, Class B building contractor or by one of the Class D building specialty contractors licensed to perform the work.

The work necessary to modify fire rated doors and door frames that is required to be performed by the doors manufacture or other approved door fabrication shop approved by the agency that provides the listing for the door and door frames.

SECTION L109
ACCESS CONTROL SYSTEM PERMIT REQUIREMENTS

Section L109.1 Access Control System Permit. In order perform work on an access control system an access control permit shall be obtained prior to the start of work on the system. All of the provisions of Section L109.1 shall be satisfied prior to the issuance of an access control system permit.

L109.1.1 Purpose and Background. A specific permit application form was developed for the installation of access control systems. This application form was designated as a Type 3B Permit. The 3B Permit allows the installation of access control systems and electric door locks in existing buildings, additions and new buildings. The 3B Permit application is intended to provide a unique permit for access control system work and to simplify the permitting process for access control systems. Previously, multiple permit applications had to be submitted for the installation of access control systems. The 3B permit allows all of the following types of permits and their corresponding access control system related work to be combined into one application (all permit types may not be required for each access control system application):

Type 1C Permit – Work performed for the installation of doors or approved modifications to doors and door jambs.

Type 3A Permit – Work performed for the interconnection of the access control system with the fire alarm and fire detection system.

Type 3 Permit – Work performed for the installation of the access control system or component that require circuits that carry more than 48 Volts AC/DC.

L109.1.2 Work Requiring an Access Control Permit. An access control system permit is required when a new access control system or electric locking systems are being installed or an existing system or electric lock is being modified in any new or existing building. An access control permit is also required when the access control system is installed outside of a building and anyone of the following conditions occur:

The exterior access control system limits or affects the occupants of the building in their ability to reach the public right-of way or a required safe dispersal area as required by IBC Section 1024.6.

The exterior access control system limits or restricts the use of the accessible route into the building.

The exterior access control system is interfaced and connected with a building's fire alarm system.

The exterior access control system is interfaced and connected to a building's elevator system.

L109.1.3 Scope of Work Covered by a Type 3B Permit. As indicated in Section L109.1.1 the Type 3B permit is intended to allow all of the work to be performed, on a single permit, that is directly related to the access control system and that must be completed by the following licensed contractors as required by Section L108.1.1 and Section 108.1.2:

Access Control System Contractor

Electrical Signal Contractor

Electrical Registration Contractor

Building Contractor Class A or B

Building Specialty Contractor Class D (related to the installation of new door and door frames and the approved modification of fire rated and labeled door and door frames).

Although the name and license number of the elevator contractor is required to be provided on the Type 3B permit, the work related to the elevator system is not covered by the Type 3B permit. A separate Type 6 elevator permit shall be obtained by a licensed elevator contractor in conjunction with the Type 3B permit when the access control system interfaces with the elevator system.

L109.1.4 Issuance of a Type 3B Permit. A Type 3B permit can only be issued to a properly licensed access control system contractor.

Exception:

The Type 3B permit can be issued to a properly registered electrical registration contractor if the access control system does not require any of the following types of work or cause any of the following conditions to occur:

Limits or restricts mechanical free egress.
Requires work to install or modify fire rated door and/or door frames.
Requires work to replace doors and/or door frames.

CPD will provide a permit inspection record card to the contractor upon issuance of the permit. The Type #3B permit contractor is responsible for obtaining the required signatures on this card for all work requiring inspection and approval by CPD.

L109.1.5 Type 3B Permit Application Requirements. All of the submittal requirements of Section L109.1.5 shall be satisfied prior to acceptance of the Type 3B permit application by CPD.

L109.1.5.1 Application Procedures. The applicant for the Type 3B permit shall be the contractor that will be performing the access control work or their authorized representative. The applicant is responsible for completing the permit application on the form provided by CPD. A complete description of work is to be provided with the application. The names and license numbers of the other contractors that will be performing work under the Type 3B permit shall be provided on the permit application. If the access control system interfaces and connects with the building's elevator system the name and license number of the elevator contractor shall be provided on the permit application for the Type 3B permit.

The permit application along with all the other submittal items required by Section L109.1.5 shall be presented for acceptance in the manner and at the location established by CPD.

L109.1.5.2 Plan Submittal Requirements. Two sets of drawings showing the entire scope of the work to be performed shall be submitted with the Type 3B permit application.

L109.1.5.2.1 Responsible Designer. The drawings shall be prepared under the direction and control of one of the following:

A licensed access control system contractor. The contractor shall indicate their review and acceptance of responsibility for the system's design by providing an original signature and the date of signature along with their contractor license number on each drawing sheet.

A licensed access control system supervisor. The supervisor shall indicate their review and acceptance of responsibility for the system's design by providing an original signature and the date of signature along with their contractor license number on each drawing sheet.

A Colorado licensed design professional. The design professional shall indicate that they are the person responsible for the design of the system by placing their State of Colorado design professional seal on each drawing. The seal shall be original or computer generated and be signed with an original signature and the date of signature shall be indicated.

The name, mailing address and phone number of the person accepting responsibility for the drawings and system design shall be indicated on the plans submitted with the permit application.

L109.1.5.2.2 Drawing Content. The plans being submitted shall provide all of the following information:

The address of the building shall be included on the drawings along with a description of the location of the work.

The plans shall clearly indicate all doors that have mechanical free egress. If mechanical free egress is not being provided, as allowed by the provisions of this appendix, the plans shall clearly indicate the doors that do not provide mechanical free egress.

Floor plans, drawn to scale, showing the device locations and door swings in plan view(s). The location of all equipment involved shall be shown on the plan view(s). The location of exit signs and the path of egress shall be shown. The floor plans shall provide sufficient information so that the affect of the access control system on the exiting scheme from the floor can be fully evaluated.

A door and hardware schedule that specifies the type and size of each door and the hardware type and function being provided on each door.

A narrative shall be provided that describes in detail the sequence of operations for the system.

When the installation of the system requires the penetration of fire rated assemblies, details and/or specifications shall be provided that indicate how the fire rating of the assembly will be maintained at the penetration in accordance with Chapter 7 of the DBC.

A one-line diagram of the system design shall be provided. The diagram shall include the source of power, battery backup if provided, and interconnection with burglar alarm or fire alarm or elevator control systems if provided. All devices in the design shall be shown on the one-line diagram. When the source of power is provided by a plug-in power supply such device shall be clearly noted on the diagram.

Point-to-point wiring details of all connections, including all interconnections to other building systems shall be shown. Other building systems include but are not limited to the power distribution system, the fire alarm system and the elevator control system.

Manufacturers specification sheets for all devices that are part of the scope of work shall be provided. Specification information shall include the approved testing agency's file number for each device. One complete set of specification sheets should be attached to each set of plans.

Sample access control drawings are included in this Appendix that can be used as examples of how to present the required information on the submittal drawings.

L109.1.5.3 Other Submittal Requirements. When fire rated door and or door frames are shop modified to accommodate the access control system installation, documentation shall be submitted with the permit application that indicates the modifications performed and the name of the shop that performed the modifications to the door or door frame. All modifications to fire rated door and door frame assemblies shall be performed by a shop that is approved by the listing and labeling agency as an approved fabricator.

L109.1.5.4 Valuation of Work. The applicant shall provide a statement for the valuation of the work to be performed under the access control system permit. The valuation of work shall be provided on a form provided by CPD. The valuation of work shall include the contractor's profit, cost of materials, labor and overhead.

L109.1.5.5 Plan Review Fee. Once the Type 3B permit application is reviewed and determined to be complete the applicant shall be required to pay the plan review fee required by the DBC.

L109.1.6 Plans Review. Upon payment of the plans review fee the Type 3B permit application will be placed in the tracking system for the plans review process. The applicant will be given an application tracking number. Once the plans review has been performed the applicant will be notified if the application is approved or denied. If the application is denied the applicant will be provided with a written list of comments that describe the reasons for the denial of the application. Upon resolution of the plans review comments the application will be approved. The permit will be issued upon payment of the building permit fee and any additional plan review fee or other fee required by the DBC.

SECTION L110
ACCESS CONTROL SYSTEM PERMIT INSPECTION PROCESS

L110.1 Access Control System Permit Inspection Process. All access control system work shall be inspected and accepted by CPD prior to starting the operation of the system. All of the requirements of Section 110.1 shall be satisfied prior to the final acceptance of the access control system work by CPD inspections.

L110.1.1 Required Inspections. The access control system contractor shall be responsible for requesting and obtaining a CPD inspector's approval on all required inspections. A separate rough-in inspection and a separate final inspection shall be performed for all of the following work:

Access control system work.

High voltage electrical work.

Fire alarm system work.

Elevator system work.

The final inspection for the access control system will not be performed until the final inspection has been approved for all of the other related work. The access control system shall be ready for inspection prior to requesting the final access control system inspection.

L110.1.2 CPD Inspector Responsibility. The following CPD inspectors shall be responsible for performing the rough-in and final inspections on the access control system work:

A CPD electrical inspector shall perform all of the inspections required for high voltage electrical work.

A CPD electrical inspector shall perform all of the inspections required for fire alarm system work.

A CPD elevator inspector shall perform all inspections required for the elevator system work.

A CPD public safety inspector shall perform the inspections on all of the work being performed under the Type 3B permit that is not inspected by another CPD inspection group.

L110.1.2.1 Inspection Related Duties. It will be the responsibility of the CPD public safety inspector to perform the following inspection related duties:

Verify that labeling has been provided on all modified fire-rated doors and frames.

Performing testing of the access control system. If testing is required to be performed by an electrical or elevator inspector, the public safety inspector shall coordinate with the other inspectors to assure that the overall systems function as designed.

Coordinate with the FPB when Fire Department related issues occur during the installation of the access control system.

Assure that the inspections record card has been signed and approved by all of the inspection groups that have been required to inspect work on the access control system being installed.

Finalize the Type 3B permit once they complete the final inspection process.

SECTION L111
ACCESS CONTROL SYSTEM TESTING AND MAINTENANCE

L111.1 Access Control System Testing. This appendix does not require mandatory access control system testing. However, it is strongly recommended that the building owner implement a periodic testing program to assure that the system and its component parts continue to operate as designed. It is further recommended that a licensed and qualified access control system contractor be retained to test and perform maintenance on the system at a maximum interval of twelve (12) months.

L111.2 Access Control System Maintenance. All access control systems shall be maintained to remain in compliance with this appendix and the specific operational requirements of the system that was originally permitted. Failure to maintain the system in compliance with the requirements of this appendix and the originally approved system design requirements and conditions shall be cause to require the operation of the system to be suspended or removed. When the access control system interfaces with the buildings fire alarm and/or elevator control systems and these systems are not maintained in a fully operational condition, the operation of the access control system may be required to be suspended until these related systems are fully operational.

SECTION L113
ACCESS CONTROL – SAMPLE DRAWINGS

L113.1 Sample Drawings. The sample drawings included in this section are intended to provide general guidance and assistance in the preparation of submittal drawings that are required to be submitted by Section 109.1 with the 3B Permit application. All of the information shown on these sample drawings shall be incorporated into the drawings that are to be used to construct the system. Additional information may be required to be shown on the drawings being submitted when unusual conditions occur or when unique systems are being installed. The following sample drawings are included:

DRAWING AC1 – TITLE SHEET – Figure 113.1 (a)
DRAWING AC2 – SEQUENCE OF OPERATION – Figure 113.1 (b)
DRAWING AC3 – FLOOR PLAN AND DOOR SCHEDULE – Figure 113.1 (c)
DRAWING AC4 – POINT-TO-POINT DIAGRAM – Figure 113.1 (d)
DRAWING AC5 – ONE LINE DIAGRAM – Figure 113.1 (e)
DRAWING AC6 – ELEVATION VIEW OF DOORS – Figure 113.1 (f)

FIGURE 113.1 (A) - DRAWING AC1 – TITLE SHEET

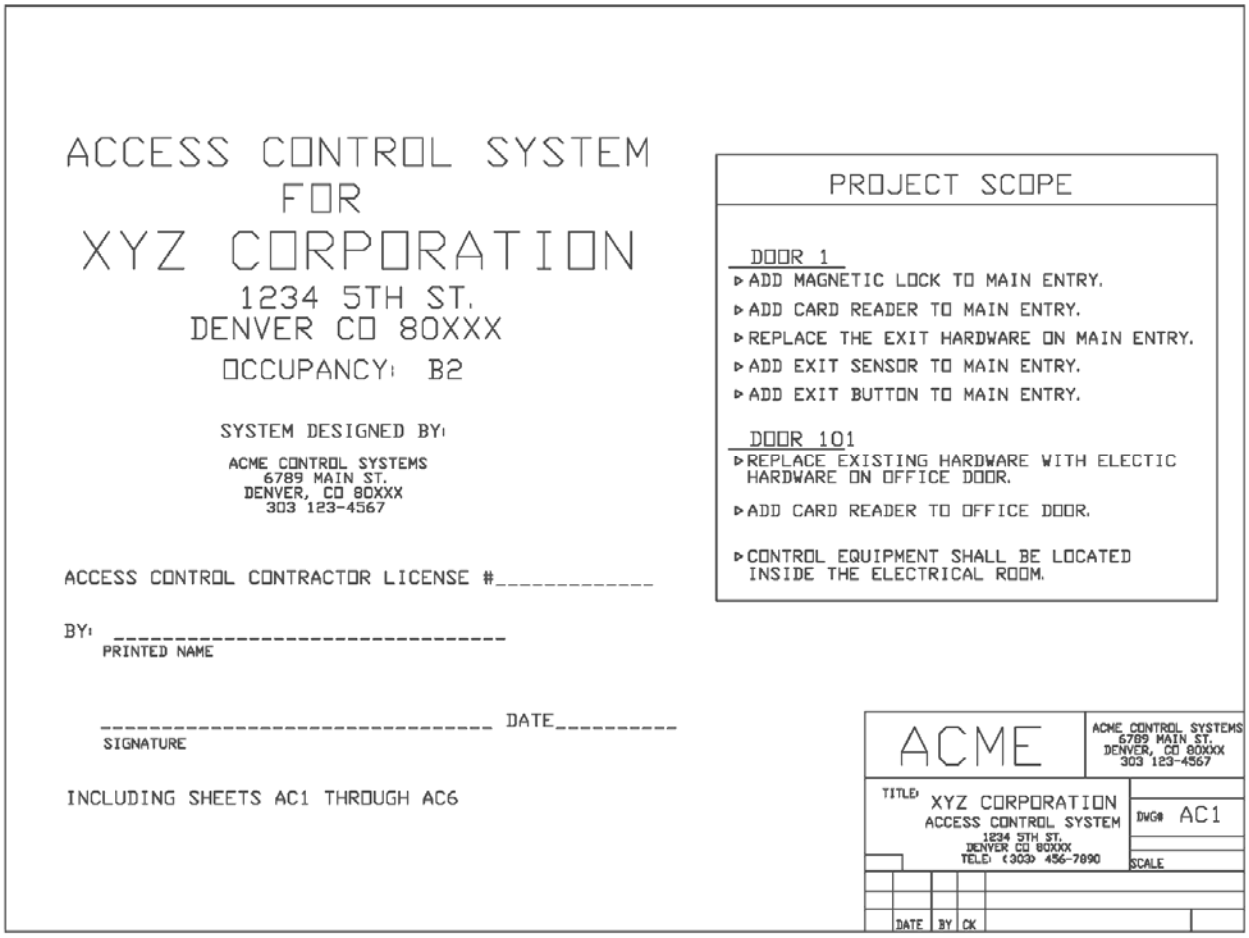


FIGURE 113.1 (A)

FIGURE 113.1 (B) - DRAWING AC2 – SEQUENCE OF OPERATION

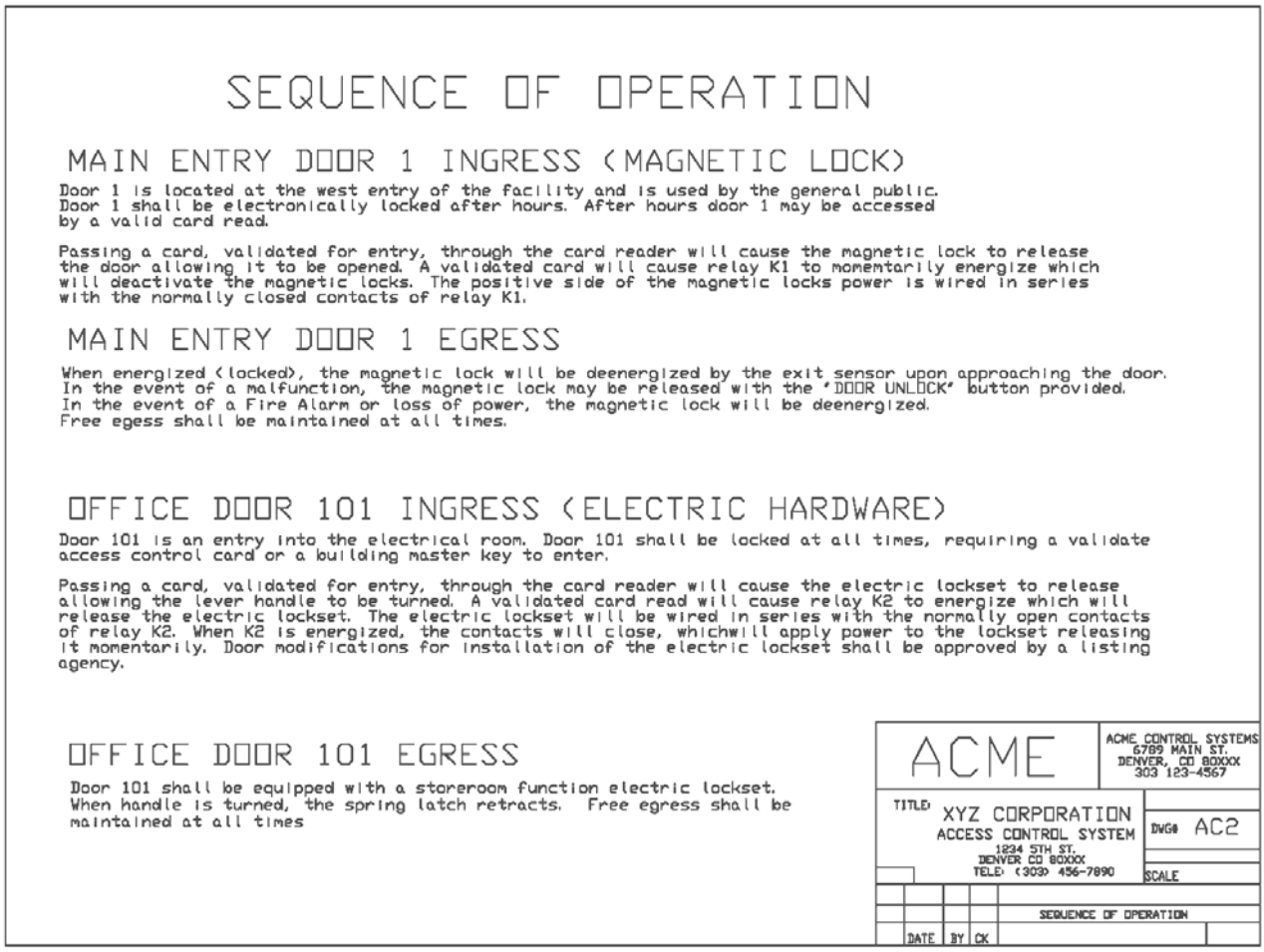

SEQUENCE OF OPERATION
MAIN ENTRY DOOR 1 INGRESS (MAGNETIC LOCK)
Door 1 is located at the west entry of the facility and is used by the general public. Door 1 shall be electronically locked after hours. After hours door 1 may be accessed by a valid card read.
Passing a card, validated for entry, through the card reader will cause the magnetic lock to release the door allowing it to be opened. A validated card will cause relay K1 to momentarily energize which will deactivate the magnetic locks. The positive side of the magnetic locks power is wired in series with the normally closed contacts of relay K1.
MAIN ENTRY DOOR 1 EGRESS
When energized (locked), the magnetic lock will be deenergized by the exit sensor upon approaching the door. In the event of a malfunction, the magnetic lock may be released with the 'DOOR UNLOCK' button provided. In the event of a Fire Alarm or loss of power, the magnetic lock will be deenergized. Free egess shall be maintained at all times.
OFFICE DOOR 101 INGRESS (ELECTRIC HARDWARE)
Door 101 is an entry into the electrical room. Door 101 shall be locked at all times, requiring a validate access control card or a building master key to enter.
Passing a card, validated for entry, through the card reader will cause the electric lockset to release allowing the lever handle to be turned. A validated card read will cause relay K2 to energize which will release the electric lockset. The electric lockset will be wired in series with the normally open contacts of relay K2. When K2 is energized, the contacts will close, whichwill apply power to the lockset releasing it momentarily. Door modifications for installation of the electric lockset shall be approved by a listing agency.
OFFICE DOOR 101 EGRESS
Door 101 shall be equipped with a storeroom function electric lockset. When handle is turned, the spring latch retracts. Free egress shall be maintained at all times
ACME
ACME CONTROL SYSTEMS
6789 MAIN ST.
DENVER, CO 80XXX
303 123-4567
TITLE: XYZ CORPORATION
ACCESS CONTROL SYSTEM
1234 5TH ST.
DENVER CO 80XXX
TELE: (303) 456-7890
DWG# AC2
SCALE
SEQUENCE OF OPERATION
DATE
BY
CK

FIGURE 113.1 (B)

FIGURE 113.1 (C) - DRAWING AC3 – FLOOR PLAN AND DOOR SCHEDULE

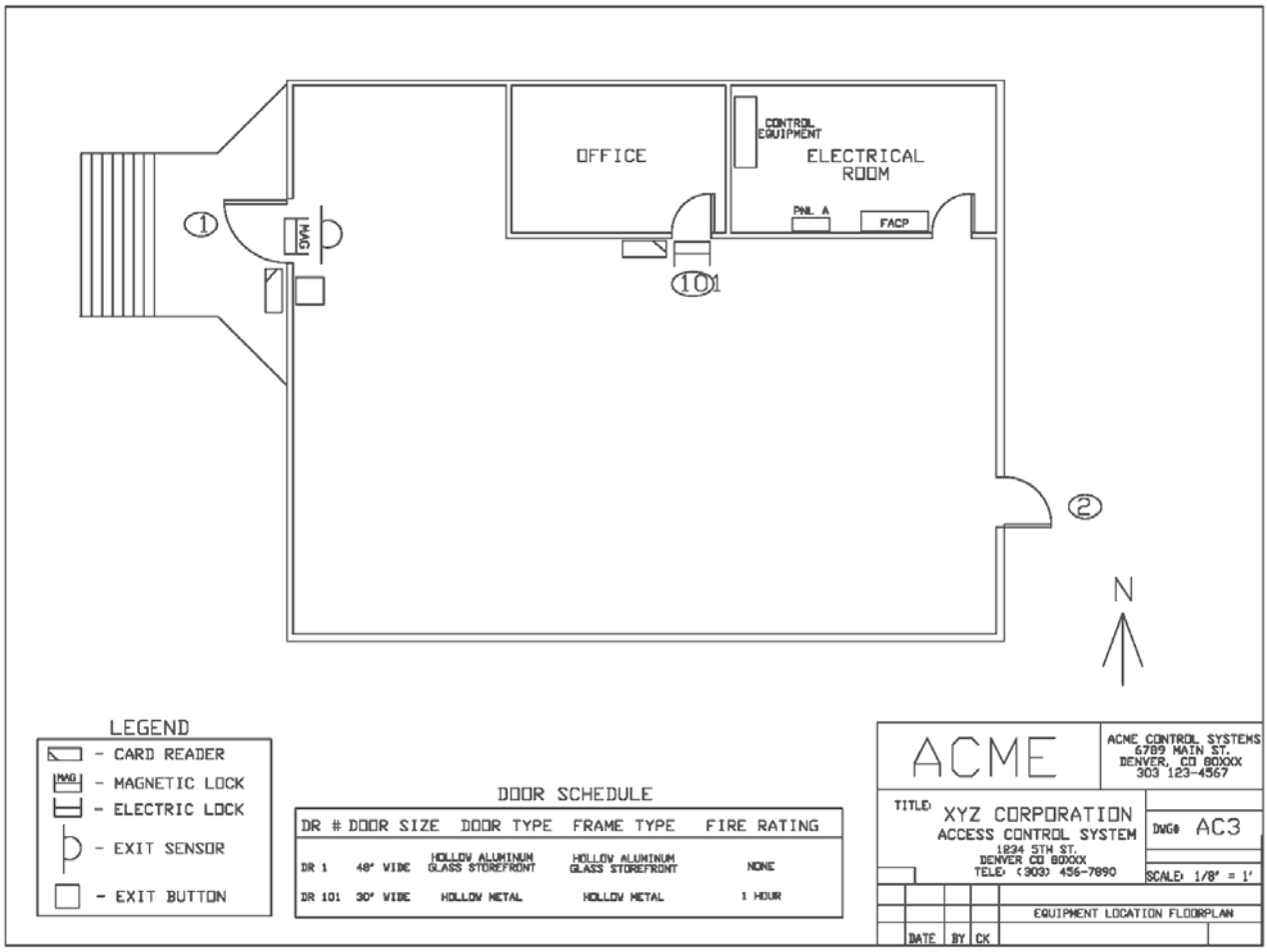


FIGURE 113.1 (C)

FIGURE 113.1 (D) - DRAWING AC4 – POINT-TO-POINT DIAGRAM

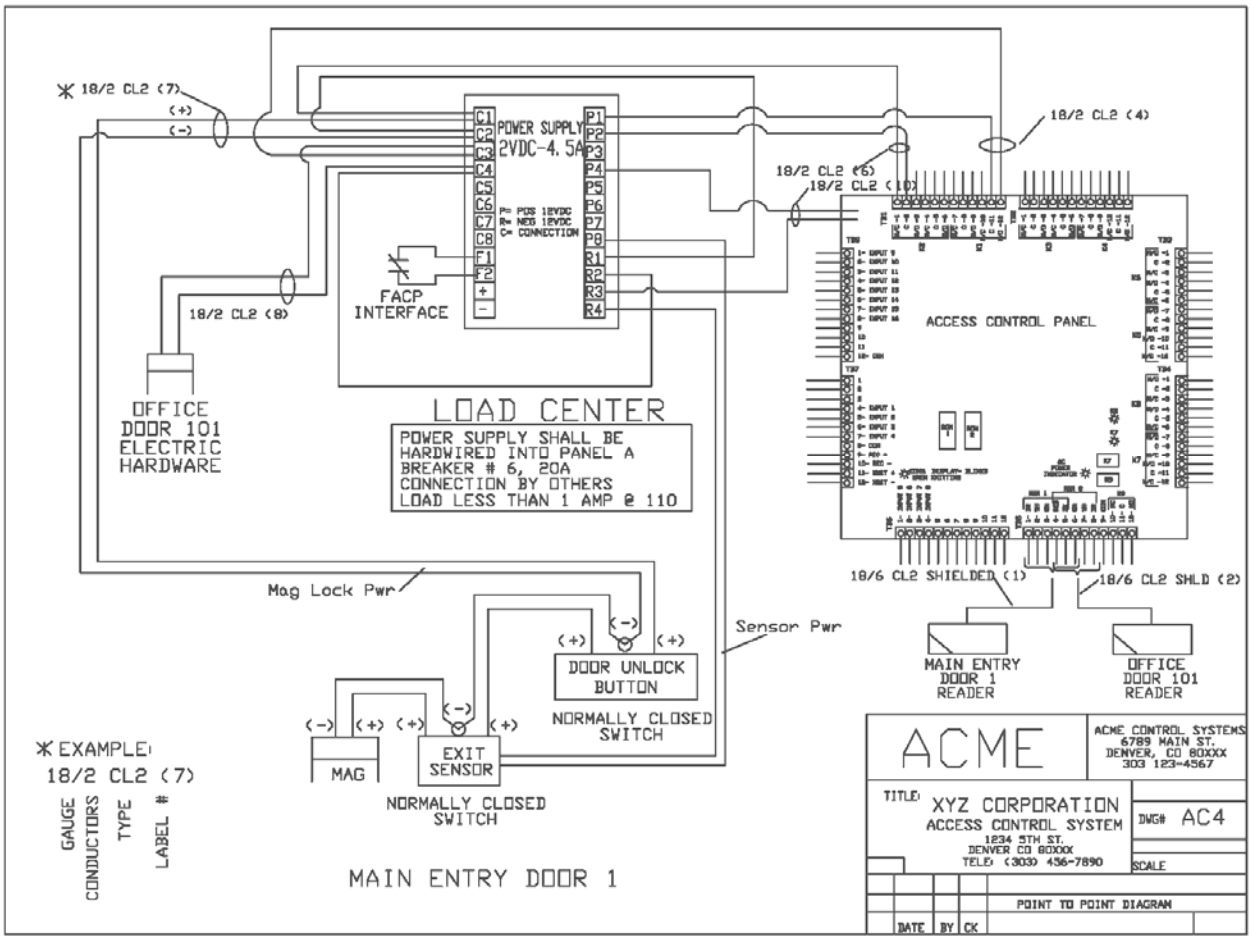


FIGURE 113.1 (D)

FIGURE 113.1 (E) - DRAWING AC5 – ONE LINE DIAGRAM

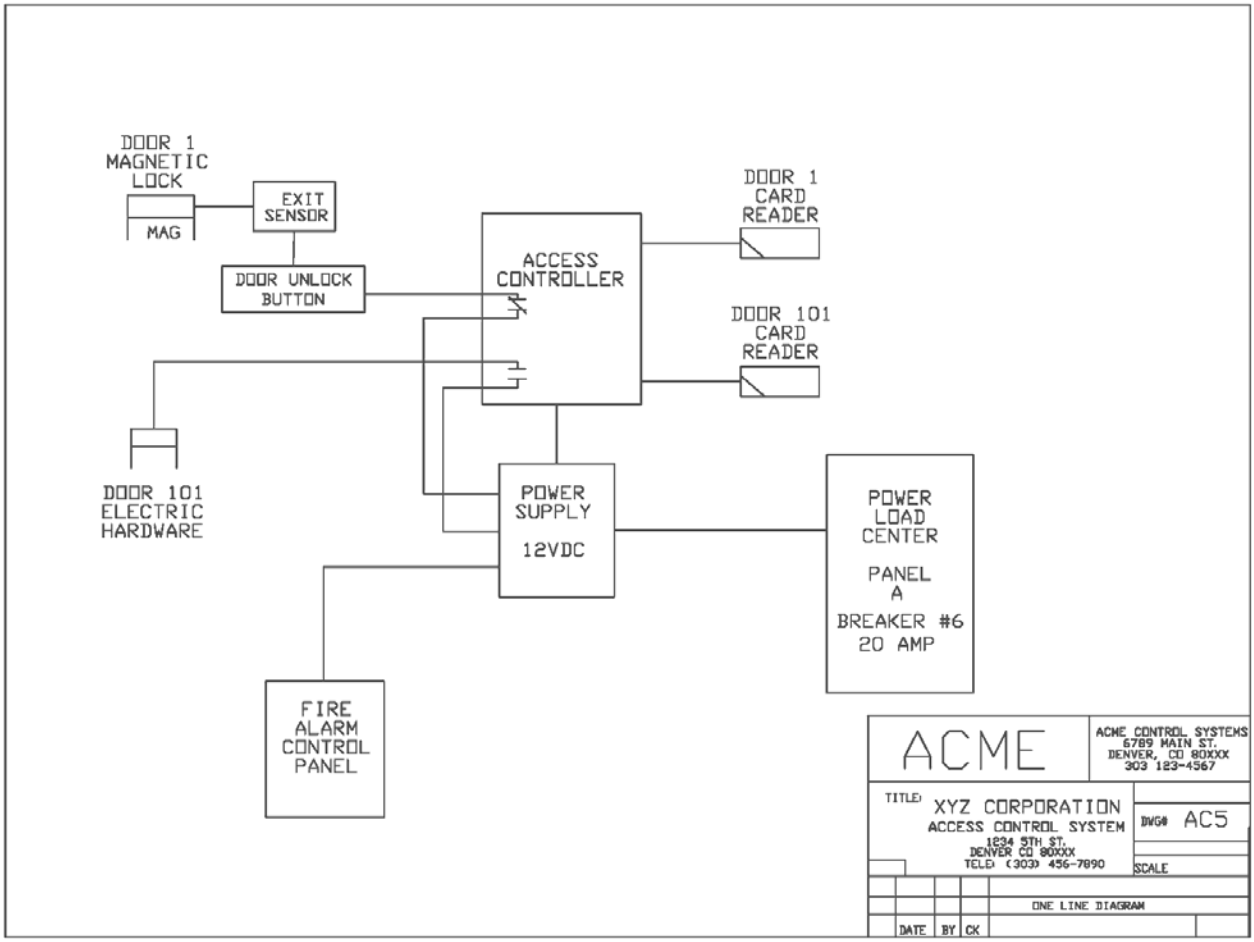


FIGURE 113.1 (E)

FIGURE 113.1 (F) - DRAWING AC6 – ELEVATION VIEW OF DOORS

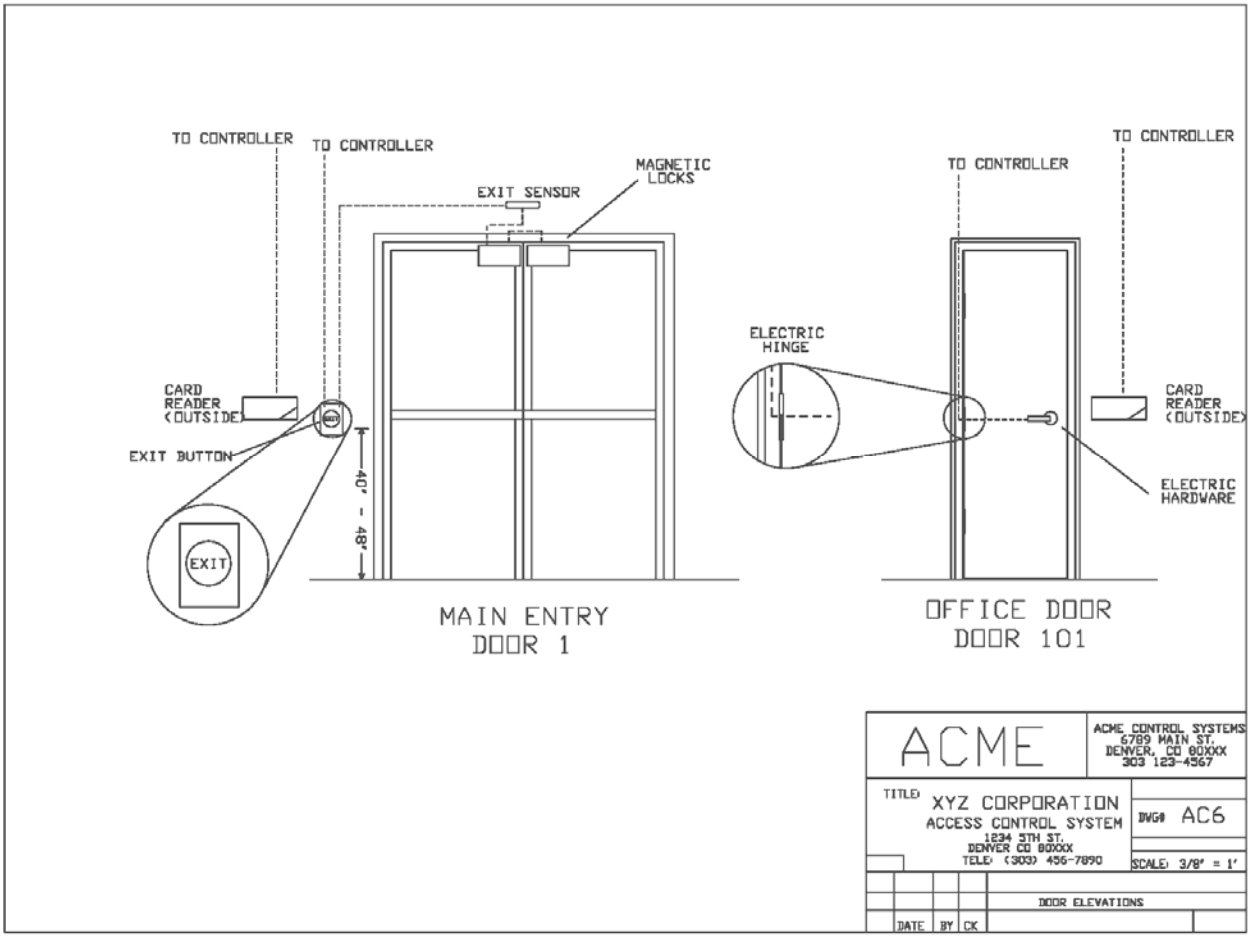


FIGURE 113.1

APPENDIX M

COLORADO TITLE 9 ARTICLE 5 - STANDARDS FOR ACCESSIBILE HOUSING

Colorado Statute Title 9, Article 5 is reproduced in this appendix for reference.

ARTICLE 5

STANDARDS FOR ACCESSIBLE HOUSING

Colorado Statutes: TITLE 9 SAFETY - INDUSTRIAL AND COMMERCIAL: BUILDINGS AND EQUIPMENT: ARTICLE 5 STANDARDS FOR ACCESSIBLE HOUSING

9-5-101.Definitions.

As used in this article, unless the context otherwise requires:

(1) "Accessibility point" means a unit of value exchanged for different levels of accessible dwelling types to satisfy the requirements for dwelling accessibility contained in this article.

(2) "Accessible route" means an interior or exterior circulation path that complies with the provisions contained in "ANSI A117.1-1998".

(3) "ANSI A117.1-1998" means the 1998 version of the "American National Standard for Buildings and Facilities Providing Accessibility and Usability for Physically Handicapped People", promulgated by the American national standards institute.

(4) "Detached residence" means a one- or two-family residence that is separated from adjacent dwellings by an unobstructed physical space. A one- or two-family residence that is separated from an adjacent dwelling by a physical space of less than three feet shall not be considered a detached residence.

(5) "Ground story level" means the lowest story in a dwelling unit containing habitable rooms or areas with an accessible entrance located on an accessible route that contains living, sleeping, cooking, bathing, and toilet facilities. For the purposes of this article, a basement shall not be considered the ground story level if the finished basement floor is located more than four feet below the exterior finished grade determined at any point along the exposed periphery of the dwelling unit.

(6) "Project" means the total number of parcels and buildings in a development planned or constructed by the same developer, builder, or entity on one site or contiguous sites, and also includes all parcels and structures that are parts of the same planned development application or agreement. The separation of contiguous individual buildings, units, lots, tracts, or parcels of land by a property line or by a public or private road shall not create a separate project.

(7) "Property" means the site, parcels of land, plats, lots, tracts, individual dwelling units, existing and proposed structures, and the built environment.

(8) "Residential dwelling unit" means any portion of a building that contains living facilities, including a room or rooms in a facility that have shared cooking, bathing, toilet, or laundry facilities such as dormitories, shelters, assisted living facilities, and boarding homes. "Residential dwelling unit" also means facilities that include provisions for sleeping, cooking, bathing, and toilet facilities for one or more persons and are used for extended stays, such as time-shares and extended-stay motels. "Residential dwelling unit" does not mean a guest room in a motel or hotel.

(9) "Technically infeasible", in reference to a proposed alteration to a building or facility, means that the proposed alteration is not implemented because:

(a) An existing structural condition or conditions make such alteration labor- or cost-prohibitive;

(b) The building or facility is in strict compliance with minimum accessibility requirements for new construction and, due to existing physical or site constraints, such alteration would negatively impact such compliance.

(10) "Type A dwelling unit" means a dwelling unit designed in accordance with the provisions of ANSI A117.1-1998, section 1002.

(11) "Type A multistory dwelling unit" means a multiple story dwelling unit with a ground story level designed in accordance with the provisions of ANSI A117.1-1998, section 1002, and, if provided, accessible laundry facilities on the ground story level.

(12) "Type B dwelling unit" means a dwelling unit with a ground floor level designed in accordance with the provisions of ANSI A117.1-1998, section 1003.

(13) "Type B multistory dwelling unit" means a multiple-story dwelling unit with a ground story level that is designed in accordance with the provisions of ANSI A117.1-1998, section 1003, and, if provided, accessible laundry facilities on the ground story level.

(14) "Type B visitable ground floor" means a multiple-story dwelling unit with an accessible entrance and toilet facility designed in accordance with the provisions of ANSI A117.1-1998, section 1003.

(15) "Undue hardship" means a substantial and unusual hardship that is the direct result of unique physical site conditions such as topography or geology, or that is the direct result of other unique or special conditions encountered on a property, but that are not typically encountered in the jurisdiction in which such property is located. Constraints, complications, or difficulties that may arise by complying with these statutory standards for accessibility but that do not constitute an undue hardship shall not serve to justify the granting of an exception or variance.

9-5-102. Disabilities covered - purpose.

(1) This article is intended to provide accessibility standards for residential projects designed to serve persons with nonambulatory disabilities, semiambulatory disabilities, sight disabilities, hearing disabilities, disabilities of incoordination, and aging.

(2) **Design criteria.** Design criteria shall comply with the 1998 version of the "American National Standard for Buildings and Facilities Providing Accessibility and Usability for Physically Handicapped People", promulgated by the American national standard institute, commonly cited as "ANSI A117.1-1998".

9-5-103. Applicability of standards - enforcement.

(1) The standards and specifications set forth in this article shall apply to all buildings and facilities used for housing that are constructed in whole or in part by the use of state, county, or municipal funds or the funds of any political subdivision of the state or that are constructed with private funds. All such buildings and facilities to be constructed from plans on which architectural drawings are started after July 1, 1975, from any one of these funds or any combination thereof shall conform to each of the standards and specifications prescribed in this article. The governmental unit responsible for the enforcement of this article shall grant exceptions to or modify any particular standard or specification when it is determined that it is impractical and would create an undue hardship. Any such exception or modification of the provisions of this article shall be made in writing as a matter of public record. These standards and specifications shall be adhered to in those buildings and facilities that are constructed or proposed on or after April 29, 2003. This article shall apply to permanent buildings.

(2) The jurisdiction with responsibility for enforcement of this article pursuant to section 9-5-104 shall designate a board of appeals to hear and resolve appeals of orders, decisions, or determinations made by the enforcing agency regarding the application and interpretation of this article.

(3) Any building or facility that would have been subject to the provisions of this article but was under construction prior to July 1, 1976, shall comply with the following:

(a) If the walls or defining boundaries of an element or space are altered, then the altered element or space shall comply with the applicable provisions of section 9-5-105, unless such alteration is technically infeasible. If full compliance with this article is technically infeasible, compliance shall be implemented up to the point of technical infeasibility. No alteration shall be undertaken that negatively impacts accessibility of a building or facility pursuant to ANSI A117.1-1998. This paragraph (a) shall not be construed to require the moving of any existing walls not otherwise planned to be moved.

(b) Any additions to a building or facility shall be treated as new construction for the purposes of enforcement of this article.

(4) The general assembly finds and declares that the standards and specifications set forth in this article are of statewide concern. Nothing in this article shall prohibit any municipality or other governmental subdivision from

making and enforcing standards and specifications that are more stringent, and thus provide greater accessibility, than those set forth in this article.

9-5-104. Responsibility for enforcing standards.

(1) The responsibility for enforcement of this article is as follows:

(a) For factory-built residential structures as defined in section 24-32-3302 (10), C.R.S., the division of housing created in section 24-32-704, C.R.S.;

(b) In a political subdivision that does not have a local building code, the division of housing created in section 24-32-704, C.R.S.;

(c) For all other housing or in a political subdivision that has adopted a building code, by the building department, or its equivalent, of the political subdivision having jurisdiction.

9-5-105. Exemptions for certain privately funded projects.

(1) Accessible dwelling units shall be provided as required in this article; except that this article does not apply to privately funded projects for the construction of a detached residence or residences or to other types of residential property containing less than seven residential units.

For the purpose of determining the number of accessibility points required pursuant to subsection (2) of this section, the accessible dwelling unit types shall have the following point values:

Accessible dwelling unit type	Accessibility point value per dwelling unit
Type A dwelling unit	6
Type A multistory dwelling unit	5
Type B dwelling unit	4
Type multistory dwelling unit	3
Type B visitable ground floor	1

(2) **Residential projects.**

(a) A project shall be assigned accessibility points based on the number of units contained within the project as follows:

Number of units within the **project**	Accessibility points **required**
0-6	0
7-14	6
15-28	12
29-42	18
43-57	24
58-71	30
72-85	36
86-99	42
100-114	48
115-128	54
129-142	60
143-157	66
158-171	72
172-185	78
186-199	84
etc.	+6 additional points every 14 units or fraction thereof

(b) A project shall include enough accessible dwelling units to achieve at least the specified number of accessibility points required pursuant to paragraph (a) of this subsection (2). A project may use any combination of accessible dwelling unit types to comply with this section.

9-5-106. Implementation plan.

The builder of any project regulated by this article shall create an implementation plan that guarantees the timely and evenly phased delivery of the required number of accessible units. Such plan shall clearly specify the number and type of units required and the order in which they are to be completed. Such implementation plan shall be subject to approval by the entity with enforcement authority in such project's jurisdiction. The implementation plan shall not be approved if more than thirty percent of the project is intended to be completed without providing a portion of accessible units required by section 9-5-105; except that, if an undue hardship can be demonstrated, or other guarantees provided are deemed sufficient, the jurisdiction having responsibility for enforcement may grant exceptions to this requirement. The implementation plan shall be approved by the governmental unit responsible for enforcement before a building permit is issued.

APPENDIX N

CONSTRUCTION OF AIRPORT BUILDINGS AND STRUCTURES

SECTION N101
GENERAL

Section N101.1 General. The provisions of this Chapter apply to the special problems that are encountered in the construction and fire protection of airport buildings and related structures. Due to the exposure of these structures by normal airport operations and the large number of people who may occupy some of the buildings, special requirements are required to assure public safety and welfare.

Section N101.2 Federal Agencies. The facilities, buildings, structures or portions thereof owned, occupied and managed by an agency of the federal government may not be subject to the provisions of this Code.

SECTION N102
DEFINITIONS

AIRCRAFT LOADING WALKWAY – An elevated device through which passengers move between a point in a passenger terminal building and an aircraft. Included in this category are walkways that may be essentially fixed and permanently placed, and walkways (jetways) that are essentially mobile in nature and fold, telescope or pivot from a fixed point at the airport terminal building or at a fixed walkway.

AIRPORT RAMP – Any outdoor area, including aprons and hard-stands, on which aircraft may be positioned, sorted, serviced or maintained, irrespective of the nature of the surface of the area.

CONCOURSE – A fully enclosed portion of the terminal building used for passenger handling and aircraft flight service functions with provisions for parking aircraft on one or more sides.

FREIGHT TERMINAL BUILDING (Air Cargo Buildings) – A structure used for the processing and/or storage of incoming or outgoing freight and other necessary functions in connection with air freight operations.

PASSENGER TERMINAL BUILDING – A structure used for air passenger enplaning or deplaning, including ticket sales, flight information, baggage handling and other necessary functions in connection with air transport operations. Passenger terminal buildings shall include any concourse or satellite buildings used for passenger handling or aircraft flight service functions. Passenger walkways, aircraft loading walkways and “mobile lounges” are excluded.

PASSENGER WALKWAY – A fully enclosed grade or ramp level walkway that is used for the enplaning or deplaning of passengers.

SATELLITE PASSENGER TERMINAL BUILDING – A structure which may be adjacent to but separated from the main passenger terminal building, accessible above ground or through subway passages, and used to provide flight service operations (i.e., passenger check-in, waiting rooms, floor service, enplaning or deplaning).

SECTION N103
TYPE OF CONSTRUCTION

Section N103.1 Passenger Terminal Buildings. Passenger terminal buildings shall be Type I or II as required for the areas allowed by Section 503. Section 507 "Unlimited Area" shall not apply to Passenger Terminal Buildings.

Exception:

The concourse or part of the concourse of a passenger terminal building may be enclosed by unprotected, noncombustible construction (i.e., walls and roof) provided the following conditions exist:

1. There is no occupied level above the concourse level or part of the concourse level being considered.
2. The maximum height of the building is less than 55 feet. This height does not include ramp or Federal Aviation Agency control towers.
3. The passenger terminal building is sprinklered.

The structures for elevated interior walkways, people movers or interconnecting crossovers within this area of unprotected, noncombustible construction shall have the same fire rating as the base building.

Section N103.2 Freight Terminal Buildings. Freight terminal buildings shall be of noncombustible construction.

Section N103.3 Aircraft Loading Walkways (Jetways). Movable jetways and fixed walkways shall meet the requirements of NAPA 417 (Aircraft Loading Walkways). No hazardous storage or operations such as fuel supply lines, fuel storage tanks, vehicular storage or fueling may occur under or near the aircraft loading walkway.

Exit doors between walkways and the passenger terminal shall swing into the passenger terminal. Doors held open shall have automatic closing devices. All other doors shall have self-closing devices and be equipped with panic hardware on the aircraft side.

Sprinkler protection is not required in the interior or exterior of movable or fixed walkways.

Section N103.4 Passenger Walkways on Grade Level. Construction shall be at least one-hour noncombustible construction.

Doors and windows shall be ¾-hour fire-rated assemblies. Glazing area of windows shall not exceed 25% of the wall area. All gate doors shall swing outward and have a self-closing device.

Entrance doors between walkways and the passenger terminal shall swing into the passenger terminal and be equipped with panic hardware on the walkway side.

Section N103.5 Other Structures. All other buildings or structures may be of any type of construction allowed for the occupancy group by this Code.

SECTION N104
OCCUPANCY

Section N104.1 Occupancy Group. The primary occupancy of the passenger terminal shall be a Group M Occupancy with the special provisions specified in this Chapter. Every building or portion thereof shall be classified by the use or the character of its occupancy according to the provisions of Chapters 3 and 4.

Section N104.2 Limitation of Occupancy. Any occupancy considered "extra-hazardous" (as defined in NFPA 13, Standard for the Installation of Sprinkler Systems) shall be prohibited in an airport terminal building.

Section N104.3 Occupant Load Factors and Occupancy Groups.

TABLE N104.3
OCCUPANT LOAD FACTORS AND OCCUPANCY GROUPS

USE	OCCUPANCY GROUP	OCCUPANT LOAD FACTOR Sq. Ft/Occupant
1. Hold Rooms		
a. Open Areas	M	30
b. Seating Areas	M	15 or fixed seat count
2. Passenger Circulation Space includes ticket area, check-in and baggage claim area	M	100
3. Office	B	See Table 1003.2.2.2
4. Retail	M	See Table 1003.2.2.2
5. Drinking and Dining Establishments		
a. Occupant Load less than 50	B	See Table 1003.2.2.2
b. Occupant Load greater than 50 Stand up service without Seating Sit down service	A2	See Table 1003.2.2.2
6. Baggage Storage/Handling		
a. Areas with vehicular access	S1	
b. Areas without vehicular access	S1	300 gross
7. Transit Stations		As required by NFPA 130

SECTION N105
MEANS OF EGRESS

Section N105.1 Building Means of Egress. Building means of egress shall comply with Chapter 10, unless specifically provided for in this Chapter.

Section N105.2 Emergency Exits. If emergency exits discharge directly onto an airport ramp or service area, the doors shall be clearly marked "Emergency Exit Only" in letters at least 2 inches high with contrasting colors in addition to exit signs as required by Section 1003.2.10 or as approved by the Department and the Fire Department.

Section N105.3 Delay Panic Hardware. All emergency exits from a passenger terminal building that discharge onto an airport ramp or service area shall be equipped with delay panic hardware. The locking device shall release without unlatching when activated by 2 alarm devices or by a loss of electrical power.

Section N105.4 Numbering. Emergency exit doors shall be numbered on both sides, 3 inches high minimum on the inside and 5 inches high minimum on the outside with contrasting colors.

Section N105.5 Control Tower. There shall be 2 exits from any control tower floor which exceeds 1,500 sq. ft. in area or where 2 or more adjacent floors have an occupant load of more than 15. Scissor stairs are allowed with the following provisions:

1. That the wall between the 2 separate stairs shall be 2-hour fire-rated minimum and with no penetrations allowed.
2. Both stairs shall be mechanically pressurized on alarm to maintain a minimum positive pressure of 0.15-inch water column relative to atmospheric pressure with all doors closed. Activation of the mechanical equipment shall be through the Fire Alarm System which shall be provided per Code:
    1. Provide a smoke detector in front of each stair door on the corridor ceiling of each floor.
    2. Provide a smoke detector on the ceiling adjacent to the elevator lobby.
    3. For air conditioning systems or pressure air supply serving more than one story, provide a smoke detector in the return air duct or plenum on each floor. The activation of any detector shall cause the return air to exhaust completely from the building without any recirculation through the building.
3. Power for the mechanical equipment and the fire alarm system smoke control shall be provided through the required emergency power section of the building electrical supply.
4. Stair shafts shall be provided with emergency lighting from the emergency power supply described in paragraph 3. In addition, battery backup supply shall be provided for these fixtures.

Section N105.6 Exterior Doors. Exterior doors shall include doors opening onto roadways on grade or elevated which provide public access/egress to passenger terminals, provided that:

1. The roadways have sidewalks, width based on occupant load, that lead to a dispersal area at grade.
2. Covered roadways are sprinklered and have at least one side open.

Section N105.7 Security Grilles and Doors. See Section 402.11.

SECTION N106
AIRPORT RAMP DRAINAGE

Section N106.1 Scope. The requirements specified herein provide standards for the design of the water drainage system of an aircraft fueling ramp to control the flow of fuel which may be spilled on a ramp and to minimize the resultant possible danger therefrom. Such a drainage system is intended to limit spread of the fuel spill to aircraft loading walkways, terminal structures or passenger loading walkways that might result in liquid or vapors reaching a source of ignition or in the accumulation of dangerous or toxic vapors.

Section N106.2 Definitions. "Aircraft Fueling Ramp" is defined as any outdoor area at an airport, including aprons and hand stands, on which aircraft are normally fueled or defueled.

Section N106.3 Aircraft Fueling Ramp Slope and Drain Design. Aircraft fueling ramps shall slope away from terminal buildings, passenger loading walkways, aircraft hangars and other structures (excluding aircraft loading walkways), with a minimum grade of 1% (1:100) for the first 50 feet (15.2 m). Beyond this distance, the slope to drainage inlets may be reduced to a minimum of 0.5% (1:200). Drainage inlets, where provided, shall be a minimum of 50 feet (15.2 m) from such structures.

Proximity of ramp drainage inlets and fueling hydrants to aircraft loading walkways shall not be restricted.

Section N106.4 Vapor Penetration Protection. Below-grade areas or blind spaces in airport terminal buildings shall be protected against flammable fuel or vapor penetration or shall be mechanically ventilated to provide at least 4 complete air changes per hour.

SECTION N107
AIRPORT SMOKE CONTROL AND DETECTION

Section N107.1 General. The smoke control systems shall be connected to the smoke detection and/or the automatic sprinkler systems, and shall automatically operate when either system is actuated. The smoke control system shall also be capable of manual operation from the Fire Command Center. During those hours when the building air conditioning systems are not operating, the smoke detection system shall activate the smoke control system. All smoke control equipment for both tenant space and terminal buildings shall be in place and operational before any part of the passenger terminal buildings is occupied. The level of protection of the fire detection system for unoccupied tenant space shall be subject to the approval of the Department and Fire Department. For any space or corridor which exceeds 20 feet in length connected to an atrium or passenger terminal area which has separate smoke control zones, provide supply air to the space or corridor at the farthest location from the point of connection to the atrium or passenger terminal area.

Exceptions:

1. Ramp service and nonpublic ramp level tenant areas of concourse buildings need not be provided with a smoke control system.
2. Unenclosed bag handling tenant areas of concourse or terminal buildings need not be provided with a smoke control system.

Section N107.2 When Required. A mechanically operated air-handling system shall be installed in the main passenger terminal building which will restrict the smoke to the general area of fire origin and maintain the exiting system in a condition that is safe for exiting. The system shall be designed so that exhausted smoke cannot contaminate the outside air intake of any system.

Section N107.3 High Rise Buildings. See Section 403.

Section N107.4 Atriums. See Section 404.

Section N107.5 Passenger Terminal Buildings.

1. The smoke control equipment for the main passenger terminal building may be separate from that serving tenant spaces.
2. The passenger terminal buildings systems shall have a product of combustion detector located in the supply air system after the air filters which will stop the supply fan upon detection. In addition, a product of combustion detector shall be provided in the return or the exhaust air stream to activate the smoke control system.
3. The passenger terminal buildings' public circulation area smoke removal systems shall provide at least 4 air changes per hour, and shall be located to preclude accumulation of smoke in any part of the public circulation areas zoned not to exceed 52,000 square feet on a single floor and must coincide with required fire sprinkler zones. Within that sprinkler zone there may be one or more air moving systems but no single smoke control zone shall be larger than the sprinkler zone. The smoke removal system shall also be capable of manual operation from the F.D. Operations Center.
4. The tenant space shall be part of a smoke control zone, not to exceed 52,000 square feet on a single floor. Tenant spaces that are within 2 adjacent smoke control zones may be connected to either of the adjacent smoke control systems.
5. The smoke control exhaust system for tenant spaces shall be sized to provide a minimum of 4 air changes per hour or 20,000 cfm from each smoke control zone, whichever is greater.
6. For tenant spaces adjoining the concourse or terminal exceeding 7,500 square feet, a separate smoke control zone shall be provided.

Section N107.6 Smoke Detection. Smoke detection shall be provided as follows:

1. There shall be an average of one detector per 2,500 square feet for areas with roof/ceilings over 25 feet above an occupied floor.

Exception:

1. Thermal detectors or cross-zone beam detectors may be used in lieu of smoke detectors where approved by the Department and Fire Department.
2. Detector zones may not exceed 20,000 square feet and no detector zone shall serve more than one smoke control zone.
3. A detector in a smoke control zone shall actuate all the adjacent zone smoke control equipment to pressurize those adjacent zones with 100% outside air while the affected smoke control zone goes into exhaust. All other smoke control zones shall remain in normal operation.

Section N107.7 Specific Requirements. The mechanically operated supply and return exhaust systems servicing smoke control zones shall be arranged to exhaust at the indicated rates when activated by the smoke detection and/or sprinkler systems; all adjoining areas or smoke control zones shall be arranged to supply 100% outside air to prevent smoke migration to the unaffected areas.

In addition to other smoke zone area requirements, passenger holding areas shall be treated as tenant spaces if separate systems are used; otherwise, they shall be treated as part of the concourse/passenger terminal public circulation space and horizontal smoke control zones shall be limited to 52,000 square feet maximum.

Section N107.8 Control Tower. Smoke control in the control tower shall be as follows:

1. Exhaust the occupied level where the fire alarm is activated at 6 air changes per hour.
2. Maintain normal HVAC operations on all other adjacent occupied levels.
3. Provide stairway pressurization and other requirements per Code.

Section N107.9 Acceptance Testing. See amended Section 910.5.

SECTION N108
AIRPORT LIFE SAFETY SYSTEMS

Section N108.1 Fire Sprinkler System. Terminal/concourse buildings shall be fully sprinklered in accordance with NFPA 13, Standard for Installation of Sprinkler Systems. Design criteria for terminal buildings shall be in accordance with ordinary Hazard Group 2 for retail and service areas and light hazard for office and passenger areas.

Section N108.1.1 Other Locations. Other locations for sprinklers shall include:

Sprinklers shall be installed at 6-foot on center each side of draft stops required at the interface of a main terminal building and a concourse building.

Kiosks or similar structures that are covered or have roofs and are located within the passenger terminal building or the concourse shall be protected by an approved automatic fire suppression system.

Exception:

No automatic fire suppression system is required if the kiosk is:

1. Noncombustible construction and less than 4 feet wide in any dimension; or
2. Portable vendor carts with a maximum size of 4 feet x 8 feet spaced at more than 10 feet between carts.

Section N108.2 Standpipe Systems. All terminal structures and control towers shall have standpipes in compliance with this Code.

Section N108.3 Manual Pull Stations. Manual pull station zones must be provided at the required exits and shall be annunciated separately. There shall be 200 feet maximum between pull stations.

Section N108.4 Fire Detection Systems. Detectors shall be located in all nonpublic areas that are not sprinklered and shall be annunciated separately. A remote status indicating light shall be located in the terminal or concourse building above each entry of an enclosed tenant area greater than 2,500 square feet as approved by the Department and Fire Department. Concealed detectors shall also be annunciated immediately outside the concealed space.

Smoke detectors shall be installed in all occupied levels for smoke control as required by 430.8.

Area smoke detectors shall be cross-zoned or addressable type with verifiable function.

Section N108.5 Emergency Communication Systems. Both one-way and 2-way systems shall be installed in all passenger terminal buildings in public areas at required exits, Building Engineering Office, Airport Operations Office, each mechanical room, emergency generator room, fire pump room, main switch gear rooms and each elevator cab which serves 4 or more stories as allowed by the Fire Department; telephone jack locations shall be approved by the Fire Department.

Section N108.6 Fire Command Center. The F.C.C. shall be provided in a space in each building as required by other Sections of this Code and approved by the Department and the Fire Department.

Section N108.7 Fire Extinguishers. Hand fire extinguishers shall be provided throughout an airport terminal building in accordance with the requirements outlined by the Fire Code for the City and County of Denver.

Section N108.8 Security Systems. Security systems shall be separate from fire alarm systems.

Exception:

Delay panic hardware systems as required in Section 430.5.3 may be part of the fire alarm system.

Section N108.9 Zones. Zones for smoke control, sprinklers, detectors, etc., shall be coordinated to have the same zones or multiples thereof, not to exceed the maximum area required by other provisions of this Code.

Section N108.10 Interface Openings. An interface shall exist between a passenger terminal concourse and connecting concourses, hotel or office occupancy. Where occupancy separations are not required, openings may be provided at the interface with the following conditions:

1. The size of the opening shall be limited to provide effective smoke control which will restrict the migration of smoke across the interface. See Section 430.8.8.
2. A noncombustible draft curtain shall be provided at the interface.
3. Automatic fire sprinklers shall be located on both sides of the draft curtain, spaced at 6 feet on center.

N108.11 Main Passenger Terminal Building Elevators and Stairs. Pressurized stairs, elevators and exit passageways are required unless otherwise approved by the Department and Fire Department.

Exception:

Elevators and enclosed stairways from the transitway station.

Elevator refuge areas are not required at the transitway station and on levels having adequate exterior doors per Section N105.6.

SECTION N109
AIRPORT MECHANICAL

Section N109.1 General. Mechanical requirements shall comply with applicable sections of this Code and referenced National Standards.

Exception:

Air exhaust openings for air conditioning or ventilating equipment, serving ramp level tenant spaces, shall be permitted where the ramp surrounds the building. Such openings shall be located a minimum of 7 feet above the ramp.

SECTION N110
AIRPORT ELECTRICAL

Section N110.1 General. Design, installation and materials shall conform to the requirement of NFPA 70, National Electrical Code and this Code.

Exceptions:

1. Runways, taxiways, ramps and all electrical systems required for their operations which are under FAA jurisdiction.
2. Airplane parking light conduit runs and junction boxes which are fed from building power systems and may be within 1-inch minimum of ramp surface covered with FAA approved sealer.

All electrical materials and equipment shall be of a type tested and listed by an approved laboratory, shall bear its label, and shall be approved for the purpose for which the materials and equipment are to be used.

Section N110.2 Grounding. See the National Electrical Code.

Section N110.3 Emergency Power. Emergency power systems, emergency generator and/or battery backup shall provide power to the following equipment:

1. Mechanical equipment for smoke control.
2. Emergency egress and exit lighting.
3. Emergency elevator power.
4. Fire alarm and detection systems.
5. Fire pump/jockey pump.
6. Emergency communication systems.
7. Delay panic hardware.

Section N110.4 Exit Signs. Exit signs with illuminated letters at least 6 inches in height shall be provided at each required exit doorway and elsewhere as required to clearly indicate the direction of egress. The letters shall be white on a green field and illuminated. Battery-operated exit signs with a minimum of 1½ hours of 100% output can be connected to a reliable power source.

Section N110.4.1 Exit Illumination. Exit illumination shall be connected to an emergency power system. Exit ways shall be illuminated to an intensity of one foot-candle at floor level during all times. Battery-operated exit illumination with a minimum of 1½ hours of 100% output can be connected to a reliable normal power source.

Section N110.5 Raceways. All wiring for power, lighting, signal, control, computer communications and telephone shall be installed in raceways. Cable tray systems shall be allowed for electrical systems not exceeding 50 volts between any conductors. Installation shall comply with the National Electrical Code.

Section N110.6 Hazardous Areas – Class 1, Division II.

1. Hazardous wiring methods shall apply within a 15-foot radius of fuel connection (fuel pit or aircraft). All measurements are referenced from the surface of ramp and the 18-inch vertical measurement shall not apply.
2. Electrical room access off of the apron area is acceptable unless within 15 feet of fueling connections. Electrical equipment within 15 feet of a fuel connection shall comply with National Electrical Code Class 1, Division II methods.

SECTION N111
SUBSURFACE TUNNELS

Section N111.1 General. All subsurface tunnels shall comply with the provisions of this section;

Section N111.2 Sprinklers. Utility Tunnels (Ordinary Group I) and Train tunnel Service Tunnels (Ordinary Group II) shall be sprinklered throughout the transit way and shall be sprinklered at the transit stations as approved by the Department and Fire Department.

Section N111.3 Smoke Removal System. A smoke removal system shall be provided.

Section N111.4 Life Safety System. All life safety systems shall be on an emergency generator.

Section N111.5 Exits. A walkway with a minimum 74-inch width (2 exit path widths of 22 inches each plus 12 inches wall clearance and an 18-inch platform edge clearance) shall be provided within all people-mover transit tunnels.

Exit doors into adjacent protected tunnels shall be provided at a maximum spacing of 200 feet and shall be monitored by the airport operations center.

Exception:

The walkway width and exit door spacing may be modified based upon an exit study submitted by the Design Professional and approved by the Department and Fire Department.

Section N111.6 Separation. A minimum 2-hour separation shall be provided between tunnels.

Section N111.7 Transit Station Separation. The transitway shall be separated from the transit station by a minimum two-hour fire-resistance-rated noncombustible walls with 1½-hour fire-protection-rated doors. Windows within these walls shall be approved 1 ½-hour fire-protection-rated windows.

Exception:

Fire-protection-rated window openings of ¾-hour may be used when the window assembly is protected with approved directional sprinkler heads 6’0” o.c. both sides of glass.

Section N111.8 Transit Systems Construction Guide. Fixed Guideway Transit Systems NFPA 130 shall be used as a construction guide unless specifically covered by this Code.

Section N111.9 Transitway Tunnel. The transitway tunnel shall be used exclusively for the movement of passengers between stations.

SECTION N112
LIQUID FUEL LINES

Section N112.1 Liquid Fuel Lines Penetrating Buildings or Structures. Liquid fuel lines that pass through or over any building or structure shall be double-walled and monitored for leakage. Liquid fuel lines that pass through buildings shall have control valves at the outside of the building penetration and shall be automatically closed upon detection of a break or leak.

SECTION N113
STANDARDS

Section N113.1 General. Unless provided for in other portions of this Building Code, the following Standards shall apply:

ORGANIZATION TITLE OF PUBLICATION

NFPA Aircraft Fueling Ramp Drainage, Pamphlet 415 - 1997
Construction and Protection of Airport Terminal Buildings, Pamphlet 416 - 1987
Construction and Protection of Aircraft Loading Walkways, Pamphlet 417 - 1985
Fixed Guideway Transit Systems, Pamphlet 130 -1988
Standard on Aircraft Hangers, Pamphlet 409 – 1995

DENVER AMENDMENTS TO THE 2006 EDITION OF THE INTERNATIONAL FIRE CODE AND APPENDICES AS PUBLISHED BY INTERNATIONAL CODE COUNCIL (ICC)

CHAPTER 1
ADMINISTRATION

SECTION 101
GENERAL

Replace Sections 101.1, 101.2 and 101.3 as follows:

101.1 Title. The title of this code is and may be cited and referred to as the Fire Code, the Denver Fire Code, or the Fire Code of the City and County of Denver. It may be referred to herein as "this code" or "the code," in both upper and lower case. The terms "Denver" and "City" are understood to mean the City and County of Denver.

101.2 Scope. This code establishes regulations affecting or relating to structures, processes, premises, and safeguards including, but not limited to:

1. Inspection of permanent and temporary buildings, processes, equipment, systems, and other fire- and safety-related situations, at intervals established by the fire code official but not to exceed once every 12 months.
2. Investigation of fires, explosions, hazardous materials incidents, and other related emergency events; the fire department shall be responsible for fire/explosion cause determination and subsequent investigation;
3. Recovery of City costs related to emergency response incidents, including the mitigation of hazardous materials incidents;
4. Storage, use, processing, handling, production and transportation of hazardous materials;
5. Storage, use, processing, handling, production and transportation of flammable and combustible gases, liquids, and solids;
6. Interior finish, decorations, furnishings, and other combustibles that contribute to fire spread, fire load, and smoke production in all occupancies;
7. Hazards from interior fires in trash, excessive storage of combustibles, production of chemical material, and other materials that pose an exposure hazard to adjacent property in all occupancies including single family residences;
8. Hazards from outside fires in vegetation, trash, storage, vehicles, combustible and flammable materials, building debris, and other materials;
9. Regulation and control including assignment of standby personnel, of special events including, but not limited to, assemblage of people, exhibits, trade shows, amusement parks, haunted houses, outdoor events, livestock events, large sporting events, and other similar special temporary and permanent occupancies;
10. Existing occupancies and conditions,
11. Maintenance and testing of all fire- and life-safety systems;
12. Access and water supply requirements for Fire Department operations;
13. Review of design plans and construction documents including drawings, calculations and specifications for the design and construction of new buildings, and alterations, additions and repairs of existing buildings;
14. Review of design plans and construction documents including drawings, calculations and specifications for the installation, alteration, addition and repair of life- and fire-safety systems, equipment, features, components, devices and apparatus including but not limited to fire protection systems, Fire Department access, water supply, flammable and combustible materials, storage, production and use of hazardous materials, commercial processes.
15. Fire and life safety education of fire brigades, employees, responsible parties, and the general public including the review and approval of emergency procedures for all occupancies and evaluation of fire drills;
16. Control of emergency operations and scenes;
17. Conditions affecting firefighter safety.
18. Licensing certification of firms/designers/installers/inspectors/testers of life safety systems equipment referenced in this code and standards and property managers, etc., responsible for the safety of others.

The provisions of this code shall supplement any and all laws relating to fire- and life-safety and shall apply equally to all of the following without restriction: persons, firms, corporations, the government of the United States of America, the government of the State of Colorado, the government of the City and County of Denver, and all agencies, subdivisions, and departments thereof. The provisions of this Code shall apply to existing conditions as well as to conditions arising after the adoption of the Code.

101.2.1 Appendices. Provisions in the appendices shall apply.

101.3 Intent. The purpose of this code is to establish the minimum requirements, consistent with nationally recognized good practice, for providing a reasonable level of occupant and pedestrian fire- and life-safety and property protection from the hazards of fire, explosion, production, use, and handling of dangerous and hazardous materials, substances, and devices, or dangerous conditions in new and existing buildings, structures, and premises, and to provide safety to firefighters and emergency responders during emergency operations.

SECTION 102
APPLICABILITY

Replace Sections 102.6 and 102.7 as follows:

102.6 Referenced codes and standards. Additional details regarding processes, methods, specifications, equipment testing and maintenance, or other pertinent criteria contained in these standards and codes listed in Chapter 45 of this Code shall be considered a part of this Code. Volumes 1 through 15 of the National Fire Codes are standards to this code. Additionally, all references to the "International Electrical Code, and "ICC Electrical Code," shall be changed to "NFPA 70, National Electrical Code (NEC)."

102.7 Subjects not regulated by this code. Where no applicable codes, standards, or requirements are set forth in this Code or contained within other laws, codes, regulations, ordinances, or bylaws adopted by the City and County of Denver Fire Department, compliance with the applicable codes and standards of the National Fire Protection Association (NFPA) or other nationally recognized and approved standards shall be deemed as prima facie evidence of compliance with the intent of this code. Nothing herein shall derogate from the authority of the City and County of Denver Fire Department to determine compliance with codes or standards for those activities or installations within the Denver Fire Department's jurisdiction or responsibility.

SECTION 103
DEPARTMENT OF FIRE PREVENTION

Add Sections 103.1.1 and 103.1.2 as follows:

103.1.1 Division of Fire Prevention and Investigation Division. The Fire Prevention and Investigation Division is established within the Fire Department of the City and County of Denver's Department of Safety under the direction of the Division Chief of Fire Prevention and Fire Investigation. This position is and may be referred to as the "Fire Code Official," "Fire Official," and "Fire Marshal," in both upper and lower case. This code shall be administrated and enforced by the Fire Code Official.

103.1.2 Rules and Regulations. The Fire Official shall have the full power to adopt, in reference to this Code, any rules, restrictions, or measures that may be advisable.

Replace Section 103.3 as follows:

103.3 Deputies. In accordance with the prescribed procedures of the City and County of Denver's Department of Safety and with the concurrence of the Chief, the Fire Code Official shall have the authority to appoint a Deputy Fire Code Official, Chief Fire Protection Engineer, Fire Protection Engineers, other related technical officers, fire inspectors, fire investigators, and employees. Their duties shall be those outlined by the Fire Code Official.

SECTION 104
GENERAL AUTHORITY AND RESPONSIBILITIES

Replace Section 104.1 as follows:

104.1 General. The Fire Prevention and Investigation Division is authorized to inspect land, buildings, structures, utilities, installations, equipment, devices, illegal processes, and materials for fire, explosion, and other emergency

hazards and to investigate and ascertain the causes of fires, explosions, releases of hazardous materials, false alarms, any unsafe conditions that relate to the protection of the public and/or property and other emergencies. The Division shall have the authority to investigate fire protection and other life safety systems that are disabled or not functioning. The Division shall also have the authority on behalf of the Department of Safety to control the use, location, and transportation of flammable or combustible liquids or acids (in a chemical or physical state) or hazardous materials; the issuance of permits; the issuance of notices, orders, or Denver County Court summonses for the correction or immediate abatement of hazardous situations; the enforcement of this code and other laws, ordinances, rules, and regulations, which are within the perspective of this Code and standards set forth in Chapter 45

Replace Section 104.3 as follows:

104.3 Right of entry. Whenever it is necessary to make an inspection to enforce the provisions of this code, or whenever the fire code official has reasonable suspicion to believe there exists in a building or upon any premises, any vehicle, or any vessel, any conditions or violations of this code that make the premises, vehicle, or vessel unsafe, dangerous, or hazardous, the fire code official shall have the authority to enter the building, vehicle, or vessel to conduct an inspection and, if necessary, an investigation, taking photographs of unsafe, dangerous, or hazardous conditions or for investigative or fire investigation purposes or the pursuance of any other emergency, or to perform the duties upon the Fire Code Official by this code. If such building, premises, or vehicle is occupied, the Fire Code Official shall present credentials to the occupant and request entry. If such building, premises, or vehicle is unoccupied, the fire code official shall first make a reasonable effort to locate the owner or other person having charge or control of the building or premises and request entry. If entry is refused, the fire code official has recourse to every remedy provided by law to secure entry.

Add Sections 104.3.2 and 104.3.3 as follows:

104.3.2 Interference with enforcement. Persons shall not interfere or cause conditions that would interfere with the fire code official carrying out any duties or functions prescribed by this code.

104.3.3 Power to protect property. The fire code official shall have power to cause the removal of any property when necessary to preserve such property from fire, explosion, or other emergency; to prevent the spreading of fire; or to protect adjoining property. No person shall be entitled to remove any property in the possession of the fire code official saved from any fire until proof of ownership thereof is furnished.

Add Section 104.4.1 as follows:

104.4.1 Impersonation. Persons shall not use a badge, uniform, or other credentials to impersonate a fire code official - prevention, engineering or investigation.

Add Section 104.6.2.1 as follows:

104.6.2.1 Frequency of inspections. Fire safety inspections for the specific property/operation shall be required at intervals established by the fire code official but not to exceed once every 12 months.

Replace Section 104.6.3 as follows:

104.6.3 Fire record. The Fire Department shall keep a record of all fires, explosions, and other emergencies occurring within its jurisdiction and of facts concerning the same, including reports (including investigation reports), photographs, videos, and statistics as to the extent of such fires and the damage or injury caused thereby, together with other information as required by the fire code official. All records shall be maintained for no less than seven (7) years.

Add Section 104.6.3.1 as follows:

104.6.3.1 Fire loss information. It shall be the responsibility of any person suffering a fire, explosion, building collapse, or other emergency resulting in injury(s) to persons and/or property loss within the City and County of Denver to report the incident and to provide the Division in writing with the dollar value of the resulting loss. If insured, the person may provide the name and address of the insurance company, in which case the insurance company shall supply the final loss figures to the Division.

Amend second sentence of Section 104.7.2 Technical assistance to read as follows:

The opinion and report shall be prepared by a professional engineer licensed by the state of Colorado and acceptable to the fire code official. The opinion and report shall analyze the fire safety properties of the design, operation or use of the building or premises and the facilities and appurtenances situated thereon, to recommend necessary changes. Whenever the technical opinion and report is required for existing technology, processes, life safety system(s),

products, facilities, materials, and uses attending the design, operation or use of a building or premises, the opinion and report shall evaluate compliance of all components/equipment to listing and code requirements.

Add Section 104.7.2.1 as follows:

104.7.2.1 Final determination. The fire code official shall make the final determination as to whether the provisions of this code have been met.

Add Sections 104.8.1 and 104.8.2 as follows:

104.8.1 Application for modification. The fire code official is authorized to modify any of the provisions of this code upon application in writing by the owner where there are practical difficulties in carrying out the provisions of the Code, provided the intent of the code shall be complied with, public safety secured, and substantial justice done.

104.8.2 Compliance with code. Buildings with equivalency, alternative, or modification approved by the building code official and fire code official shall be considered conforming to the code.

Add Sections 104.9.1 and 104.9.2 as follows:

104.9.1 Fire protection features. Each application for an alternate fire protection feature shall be filed with the fire code official and shall be accomplished by such evidence, letters, statements, test results, or other supporting information as required to justify the request. The fire code official shall keep a record of actions on such applications, and a signed copy of the Fire code official's decision shall be provided for the applicant.

104.9.2 Building Code. Whenever the alternate material or method involves matters regulated by the Fire Code and Building Code, approvals are also subject to approval of the building code official.

Replace Sections 104.10 and 104.10.1 as follows:

104.10 Fire investigations. The Division is authorized to investigate without delay the cause, origin, and circumstances of each and every fire or explosion or intent to commit such an act occurring within the City and County of Denver involving the loss of life or injury to a person or destruction or damage to property and, if it appears to the fire investigators that such fire or explosion is of suspicious origin, the investigators are authorized to take immediate charge of all physical evidence relating to the intent or cause of the fire and are authorized to pursue the investigation to its conclusion.

104.10.1 Release of hazardous materials. The fire code official is authorized to investigate the cause, origin, and circumstances of unauthorized releases of hazardous materials. The fire code official is authorized to recover from the responsible party(s) all costs incurred by the City for mitigation, rendering the release harmless to people or property, including personnel and equipment, securing the incident scene, removal of materials released and cleanup.

Add Sections 104.10.2, 104.10.3, and 104.10.4 as follows:

104.10.2 Authorization of Denver Police Department. The Denver Police Department is authorized to assist the Fire Department in any investigation when requested to do so by the Manager of Safety, the Fire Chief, or the fire code official.

104.10.3 Limiting access. The Fire Department shall have the authority to limit access to buildings, property, vehicles, vessels, or other similar conveyances by any vehicle, vessel, or person during an investigation.

104.10.4 Interference with enforcement. Persons shall not interfere, nor cause conditions that would interfere with, the fire investigator carrying out any duties or functions, including arrest of suspects, prescribed by this Code.

Add Section 104.11.1.1 as follows:

104.11.1.1 Scene barrier. The incident commander in charge of an emergency scene shall have the authority to establish barriers to control access in the vicinity of such emergency and to place, or cause to be placed, ropes, guards, barricades, or other obstructions across any public or private street or alley, to delineate an emergency scene barrier(s). No person, except as authorized by the incident commander in charge of the emergency, shall be permitted to cross barriers established in accordance with Sections 104.11.1 and 104.11.1.1. Whenever the emergency incident involves private property, the owner of said property shall be responsible for all costs related to placement, rental and use of barricades.

Add Section 104.11.3.1 as follows:

104.11.3.1 Resetting or silencing of alarms. No person shall reset or silence a system unless by direction of the fire chief , fire code official or fire department official in charge of the incident.

Add Sections 104.11.4 and 104.11.5 as follows:

104.11.4 Emergency power to demolish buildings. When a fire is in progress, the fire code official, or the officer in charge of the fire, may order any building that is in close proximity to such fire to be torn down, blown up, or otherwise disposed of for the purpose of checking the conflagration. The property owner shall be responsible for all costs related to all operations.

104.11.5 Cost recovery. The property owner shall be responsible for all costs related to placement, rental and use of barricades.

SECTION 105
PERMITS

Replace Section 105.1 as follows:

105.1 General. The Fire code official shall be authorized to establish and issue permits, certificates, notices, approvals, or orders pertaining to fire and hazard control and fire and explosion hazards wherever indicated by this Code. A permit issued under the provisions of this Code shall continue until revoked or for such a period of time designated therein at the time of issuance. Such permit shall not be transferable, and any change in use, occupancy, operation, or ownership shall require a new permit. Permits for activities requiring evidence of financial responsibility by the jurisdiction shall not be issued unless proof of required financial responsibility is furnished. Any attempt to misrepresent or otherwise deliberately or knowingly design; install; service; maintain; operate; sell; represent for sale; falsify records, reports, or applications; or act in any related activity in violation of the requirements prescribed by this Code shall be a violation of this Code. Such violations shall be cause for immediate suspension or revocation of any related licenses, certificates, or permits issued by the Fire code official. In addition, any such violation shall be subject to any other criminal or civil penalties as available by the laws of this jurisdiction. An inspection is required prior to the issuance of a permit. Any person who engages in any business, operation, or occupation, or uses any premises, after the permit issued therefore has been suspended or revoked pursuant to the provisions of this Code, and before such suspended permit has been reinstated or a new permit has been issued, shall be in violation of this Code.

Add Section 105.1.4 as follows:

105.1.4 Other required permits. The requirements for permits from other City agencies shall not waive the requirement for permits required by this Code. Where a permit is required by other City agencies, such permit shall be obtained prior to or simultaneous with the issuance of a permit required by this Code.

Replace Section 105.6 as follows:

105.6 Required permits. The fire code official is authorized to issue permits for the operations set forth in Sections 105.6.1 through 105.6.147:

105.6.1 Abandoned buildings. A permit is required for abandoned buildings. (See IFC Section 311.)

105.6.2 Aerosol products. A permit is required to manufacture, store or handle an aggregate quantity of Level 1, Level 2 or Level 3 aerosol products in excess of 300 pounds (136 kg) net weight.

105.6.3 Air compressor. A permit is required for building smoke management and fire protection systems – certificate of fitness in accordance with ASME Code.

105.6.4 Aircraft hangar. A permit is required per bay or square footage per NFPA 409.

105.6.5 Aircraft refueling vehicles. A permit is required for each aircraft refueling vehicle.

105.6.6 Amusement buildings. A permit is required to operate a special amusement building.

105.6.7 Appliances fueled by waste petroleum products. A permit is required to operate appliances fueled by waste petroleum products.

105.6.8 Asbestos removal. A permit is required for the removal of asbestos (for each building or portion thereof).

105.6.9 Asphalt kettles (other than roofing operations). A permit is required to transport and operate an asphalt kettle.

105.6.10 Automobile wrecking yard. A permit is required for the operation of an automobile wrecking yard.

105.6.11 Aviation facilities. A permit is required to use a Group H or Group S occupancy for aircraft servicing or repair and aircraft fuel servicing vehicles. Additional permits required by other sections of this code include, but are not limited to, hot work, hazardous materials, and flammable or combustible products.

105.6.12 Battery charging. A permit is required to charge batteries on or off powered-industrial trucks and similar equipment having an electrolyte capacity in excess of 10 gallons.

105.6.13 Battery systems. A permit is required for stationary storage battery systems having an electrolyte capacity in excess of 10 gallons.

105.6.14 Blank cartridges. A permit is required prior to the purchase of blank pyrotechnic cartridges. No dealer shall sell blank cartridges except upon presentation of an authorized permit.

105.6.15 Bonfires / Rubbish fires. A permit is required for bonfires and rubbish fires.

105.6.16 Bowling alley refinishing. A permit is required to refinish bowling alleys.

105.6.17 Building emergency communication system. A permit is required to test the emergency communication system.

105.6.18 Building fire alarm system. A permit is required to test the fire alarm system.

105.6.19 Building fire protection system. A permit is required to test the fire protection system.

105.6.20 Building fire standpipe system. A permit is required to test the fire standpipe system.

105.6.21 Building property manager certification. A permit is required to obtain training and certification for building property managers.

105.6.22 Burning in public places/Open burning. A permit is required for the kindling or maintaining of an open fire or a fire on any public street, alley, road, or other public or private ground. Instructions and stipulations of the permit shall be adhered to.

Exception:

Recreational fires when a fire ban has not been instituted.

105.6.23 Candles and open flames in assembly areas. A permit is required to use open flames or candles in connection with assembly areas, dining areas of restaurants or drinking establishments.

105.6.24 Canopies. A permit is required to erect a canopy having an area as follows:

105.6.24.1 Canopies having an area in excess of 300 square feet but less than 500 square feet.

105.6.24.2 Canopies having an areas in excess of 500 square feet.

105.6.25 Carnivals and fairs. A permit is required to conduct a carnival or fair. The event coordinator shall be responsible for obtaining a permit which can be issued for a single event or annually; vendors shall be responsible for individual permits for booths.

105.6.26 Cellular/wireless signal repeater sites. A permit is required to install and maintain cellular/wireless signal repeater sites.

105.6.27 Cellulose nitrate film. A permit is required to store, handle, use, or display cellulose nitrate film.

105.6.28 Certification – Construction fire safety officer. Includes point-of-contact relative to permits.

105.6.29 Chemical tanks/cryogenic towers. A permit is required for use of chemical tanks/cryogenic towers.

105.6.29.1 Installation/modification of chemical tanks/cryogenic towers.

105.6.29.2 Removal/Abandonment of chemical tanks/cryogenic towers.

105.6.30 Chili roaster. A permit is required to operate a chili roaster as follows:

105.6.30.1 An LPG fuel permit – 300 lb. maximum

105.6.30.2 Setbacks must be approved.

105.6.31 Combustible fibers. A permit is required for the storage and handling of combustible fibers in quantities greater than 100 cubic feet (2.8 m^3).

Exception:

A permit is not required for agricultural storage.

105.6.32 Combustible material storage. A permit is required to store in any building or upon any premises in excess of 2,500 cubic feet (71 m^3) gross volume of combustible empty packing cases, boxes, barrels or similar containers, rubber tires, rubber, cork or similar combustible material.

105.6.33 Commercial rubbish. A permit is required to operate a rubbish or recycling handling facility.

105.6.34 Compressed gases (not LPG). The minimum quantities of compressed gas requiring permit shall be as set forth in Table 105.6.34.

TABLE 105.6.34
PERMIT AMOUNTS FOR COMPRESSED GASES

Type of Gas	Amount (cubic feet at NTP)
Corrosive, Irritant, Sensitizer	200
Flammable (except cryogenic fluids and Liquefied petroleum gases)	200
Highly toxic	Any Amount
Inert and simple asphyxiant	6000
Oxidizing (including oxygen)	504
Pyrophoric	Any Amount
Radioactive	Any Amount
Toxic	Any Amount
Unstable (Reactive)	Any Amount
Other health hazard	650

For SI: 1 cubic foot = 0.02832m^3.

105.6.35 Compressed natural gas (CNG). A permit is required to install, modify, or remove a compressed natural gas tank.

105.6.36 Covered mall buildings. A permit is required for:

1. The placement of retail fixtures and displays, concession equipment, displays of highly combustible goods and similar items in the mall.
2. The display of liquid- or gas-fired equipment in the mall.
3. The use of open-flame or flame-producing equipment in the mall.

105.6.37 Cryogenic fluids. A permit is required to produce, store, transport on site, handle or dispense cryogenic fluids in excess of the amounts listed in Table 105.6.37.

TABLE 105.6.37
PERMIT AMOUNTS FOR CRYOGENIC FLUIDS

Type of Cryogenic Fluid	Inside Building (gallons)	Outside Building (gallons)
Flammable	More than 1	60
Inert	60	500
Oxidizing (includes oxygen)	10	50
Physical or health hazard not indicated above	Any Amount	Any Amount

105.6.38 Cutting and welding. A permit is required to conduct cutting or welding operations within the jurisdiction.

105.6.39 Demolition by explosives. A permit is required for the use of any explosive device for demolition operations.

105.6.40 Dry cleaning plants. A permit is required to engage in the business of dry cleaning or to change to a more hazardous cleaning solvent used in existing dry cleaning equipment.

105.6.41 Dust-producing operations. A permit is required for all dust-producing operations. This permit does not include woodworking.

105.6.42 Emergency/standby electrical generator and fire pump – fuel tank system. A permit is required for fuel tank systems per tank—integral day tank, remote day tank and main tank. Generators utilizing natural gas are required to have a permit for the natural gas connection.

105.6.43 Equipment testing. A permit is required to test equipment as follows:

105.6.43.1 Fire alarm systems. Smoke detector, horn/strobe, etc. Annual permit does not include overtime costs.

105.6.43.2 Fire protection systems. Sprinkler head, flow switch, etc. Annual permit does not include overtime costs.

105.6.43.3 Smoke management systems. Annual permit does not include overtime costs.

105.6.43.4 Standpipe systems. Annual permit does not include overtime costs.

105.6.44 Exhibits and trade shows. A permit is required to operate exhibits and trade shows.

105.6.45 Explosives/blasting agents. A permit is required for the manufacture, storage, handling, sale or use of any quantity of explosives, explosive materials, fireworks or pyrotechnic special effects within the scope of Chapter 33.

Exception:

Storage in Group R-3 occupancies of smokeless propellant, black powder and small arms primers for personal use, not for resale and in accordance with Section 3306.

105.6.46 Failure to obtain a permit. A temporary permit is required when a required permit has not been obtained. The fee for this temporary permit shall be double the cost of the required permit.

105.6.47 File search. A fee is required for the following file searches:

105.6.47.1 Fire Prevention/Hazardous materials

105.6.47.2 Amendment packet

105.6.47.3 Fire investigation records including videotapes

105.6.47.4 Property records

105.6.47.5 Inspection and permit records

105.6.48 Fire alarm signal delay equipment. A permit is required to install and maintain fire alarm signal delay equipment integrated with the FACP.

105.6.49 Fire department fire alarm radio transmitter (wireless Denver Fire Department radio box). A permit is required to install and maintain fire department fire alarm radio equipment for monitoring fire and burglar alarms.

105.6.50 Fire hydrants and valves. A permit is required to maintain a private fire hydrant system. This applies to existing systems only. New private fire hydrant systems are prohibited.

105.6.51 Fire protection system maintenance. A permit is required to perform maintenance on a private fire hydrant system.

105.6.52 Fire pumps and related equipment. A permit is required to inspect and test fire pumps and related equipment.

105.6.53 Fire watch. A permit is required whenever a fire watch is mandated.

105.6.54 Fireworks /pyrotechnics. A permit is required for all professional pyrotechnic programs.

105.6.55 Flammable or combustible liquids. A permit is required:

1. To use or operate a pipeline for the transportation within facilities of flammable or combustible liquids. This requirement shall not apply to the off-site transportation in pipelines regulated by the Department of Transportation (DOTn) nor does it apply to piping systems.
2. To store, handle or use Class I liquids in excess of 30 gallons (114 L) in a building or in excess of 60 gallons (228.6 L) outside of a building, except that a permit is not required for the following:

   2.1. The storage or use of Class I liquids in the fuel tank of a motor vehicle, aircraft, motorboat, mobile power plant or mobile heating plant, unless such storage, in the opinion of the code official, would cause an unsafe condition.

   2.2. The storage or use of paints, oils, varnishes or similar flammable mixtures when such liquids are stored for maintenance, painting or similar purposes for a period of not more than 30 days.
3. To store, handle or use Class II or IIIA liquids in excess of 60 gallons (228.6 L) in a building or in excess of 120 gallons (457.1 L) outside a building, except for fuel oil used in connection with oil-burning equipment.

   3.1 To store, handle or use Class IIIB liquids in excess of 1,000 gallons in a building or outside a building.
4. To remove Class I or Class II liquids from an underground storage tank used for fueling motor vehicles by any means other than the approved, stationary on-site pumps normally used for dispensing purposes.
5. To operate tank vehicles, equipment, tans, plants, terminals, wells, fuel-dispensing stations, refineries, distilleries and similar facilities where flammable and combustible liquids are produced, processed, transported, stored, dispensed or used.
6. To place temporarily out of service (for more than 90 days) an underground, protected above-ground or above-ground flammable or combustible liquid tank.
7. To change the type of contents stored in a flammable or combustible liquid tank to a material which poses a greater hazard than that for which the tank was designed and constructed.
8. To manufacture, process, blend or refine flammable or combustible liquids.
9. To engage in the dispensing of liquid fuels into the fuel tanks of motor vehicles at commercial, industrial, governmental or manufacturing establishments.
10. To utilize a site for the dispensing of liquid fuels from tank vehicles into the fuel tanks of motor vehicles at commercial, industrial, governmental or manufacturing establishments.
11. A site plan shall be submitted showing the following: distances from all buildings, property lines, utility poles, power lines, railroad tracks, etc. A Hazardous Materials Inventory Statement (HMIS) may be required upon request**.**

105.56 Floor cleaning. A permit is required for floor cleaning operations using 3A combustible liquids.

105.56.1 Single address/ one time

105.56.2 Annual/same building

105.56.3 Annual/multiple sites

105.6.57 Floor finishing. A permit is required for floor finishing or surfacing operations exceeding 350 square feet (33 m^2) using Class I or Class II liquids.

105.6.58 Fruit and crop ripening. A permit is required to operate a fruit- or crop-ripening facility or conduct a fruit-ripening process using ethylene gas.

105.6.59 Fumigation/thermal insecticidal fogging. A permit is required to operate a business of fumigation or thermal insecticidal fogging and to maintain a room, vault or chamber in which a toxic or flammable fumigant is used.

105.6.60 Garages. A permit is required for operation of a motor vehicel repair garage. This permit does not include other permits required by this code.

105.6.61 Halogenated agent systems/extinguishers. A permit is required to install and maintain a halogenated extinguishing agent system or portable fire extinguishers.

105.6.62 Halogenated hydrocarbons. A permit is required for the storage or use of halogenated hydrocarbons.

105.6.63 Hazardous materials. A permit is required to store, transport on site, dispense, use or handle hazardous materials in excess of the amounts listed in Table 105.6.63.

TABLE 105.6.63

PERMIT AMOUNTS FOR HAZARDOUS MATERIALS

TYPE OF MATERIAL	AMOUNT
Carcinogens	
Liquids	1 gallon
Solids	10 pounds
Combustible liquids	See Section 105.6.55
Corrosive materials	
Gases	See Section 105.6.34
Liquids	55 gallons
Solids	550 pounds
Explosive materials	Any Amount
Flammable materials	
Gases	See Section 105.6.34
Liquids	See Section 105.6.55
Solids	100 pounds
Cryogenics	See Section 105.6.37
Highly toxic materials	
Gases	See Section 105.6.34
Liquids	Any Amount
Solids	Any Amount
Irritants	
Liquids	55 gallons
Solids	550 pounds
Other Health Hazards	
Liquids	55 gallons
Solids	550 pounds
Oxidizing materials	
Gases	See Section 105.6.34
Liquids	
Class 4	Any Amount
Class 3	1 gallon[a]
Class 2	10 gallons
Class 1	55 gallons
Solids	
Class 4	Any Amount
Class 3	10 pounds[b]
Class 2	100 pounds
Class 1	500 pounds
Cryogenics	See Section 105.6.37
Organic peroxides	
Liquids	
Class I	Any Amount
Class II	Any Amount
Class III	1 gallon
Class IV	2 gallons
Class V	No Permit Required
Solids	
Class I	Any Amount
Class II	Any Amount
Class III	10 pounds
Class 1V	20 pounds

TYPE OF MATERIAL	AMOUNT
Class V	No Permit Required
Pyrophoric materials	
Gases	See Section 105.6.34
Liquids	Any Amount
Solids	Any Amount
Radioactive materials	
Not sealed	1 microcurie
Sealed	1 millicurie
Sensitizers	
Liquids	55 gallons
Solids	550 pounds
Toxic materials	
Gases	See Section 105.6.34
Liquids	Any Amount
Solids	Any Amount
Unstable (reactive) materials	
Liquids	
Class 4	Any Amount
Class 3	Any Amount
Class 2	1 gallon
Class 1	10 gallons
Solids	
Class 4	Any Amount
Class 3	Any Amount
Class 2	10 pounds
Class 1	100 pounds
Water-reactive materials	
Liquids	
Class 3	Any Amount
Class 2	5 gallons
Class 1	10 gallons
Solids	
Class 3	Any Amount
Class 2	50 pounds
Class 1	100 pounds
Biohazard	Any Amount

For SI: 1 gallon=3.785L, 1 pound=0.454 kg.

a. 20 gallons when Table 2703.1.1(1) Note k applies and hazard identification signs in accordance with Section 2703.5 are provided for quantities of 20 gallons or less.

b. 200 pounds when Table 2703.1.1(1) Note k applies and hazard identification signs in accordance with Section 2703.5 are provided for quantities of 200 pounds or less.

105.6.64 Hazardous materials inventory statement plan review. A permit is required for review and comment of any HMIS.

105.6.64.1 HMIS – with less than 10 entries.

105.6.64.2 HMIS – with 10 or more entries.

105.6.65 Hazardous production materials. A permit is required to store, handle or use hazardous production materials.

105.6.66 Hazardous waste generator. A permit is required for any operation that generates hazardous waste.

105.6.67 Heliports and helistops. A permit is required for the operation of any heliport or helistop.

105.6.68 High-piled storage. A permit is required to use a building or portion thereof as a high-piled storage area exceeding 500 square feet (46 m^2).

105.6.69 Holiday decorations in public assembly occupancies. A permit is required to use any holiday decorations – natural vegetation, crepe paper, etc. in any public assembly occupancy.

105.6.70 Hot work operations. A permit is required for hot work including, but not limited to:

1. Public exhibitions and demonstrations where hot work is conducted.
2. Use of portable hot work equipment inside a structure.
3. Fixed-site hot work equipment such as welding booths.
4. Hot work conducted within a hazardous fire area.
5. Application of roof coverings with the use of an open-flame device.

105.6.71 Hypergolic materials. A permit is required to store or use any amount of hypergolic materials.

105.6.72 Industrial trucks. A permit is required for all industrial trucks in accordance with NFPA 505.

105.6.73 Insecticides/pesticides/fumigants. A permit is required to apply, sell and manufacture insecticides, pesticides or fumigants.

105.6.73.1 One location/one time

105.6.73.2 Annual/multiple locations

105.6.74 Interim permit. An interim permit may be issued allowing work under restrictions or conditions while awaiting submittal of installation documents.

105.6.75 Interior fire alarm system maintenance. A permit is required to maintain fire alarm equipment.

105.6.76 Laboratories. A permit is required to operate a laboratory that stores or uses hazardous materials or flammable substances.

105.6.77 Limited fueling and other fuel transport operations. A permit is required for each vehicle approved for limited fueling and fuel transport operations.

105.6.78 Liquefied chlorine. A permit is required to store, use, sell and transport liquefied chlorine.

105.6.79 Liquefied- or gas-fueled vehicles or equipment in assembly buildings. A permit is required to display, operate or demonstrate liquid- or gas-fueled vehicles or equipment in assembly buildings.

105.6.80 LPG. A permit is required for:

105.6.80.1 Annual filling or exchange – tank or cage (Amount of gas calculated and assessed separately.)

105.6.80.2 Install, modify or remove any container or system

105.6.80.3 Operate/maintain any container or system

105.6.80.4 Limited operations/construction sites

105.6.80.5 Roofing operation

105.6.80.6 Operation of cargo tankers that transport LP gas.

105.6.81 Lubricating oils. A permit is required to transport, store, sell or use over 100 gallons of lubricating oils.

105.6.82 Lumber yards. A permit is required for the storage or processing of lumber exceeding 100,000 board feet (8,333 ft^3) (236 m^3).

105.6.83 Magnesium. A permit is required to melt, cast, heat treat or grind more than 10 pounds (4.54 kg) of magnesium.

106.6.83.1 Matches. A permit is required for bulk storage of matches.

105.6.83.2 Medical gas systems. A permit is required for each medical gas system.

105.6.84 Motor fuel storage systems. A permit is required for certification to install, test, alter, repair or remove equipment.

105.6.85 Motorcycle vehicle repair shops. A permit is required to operate a motorcycle vehicle repair shop.

105.6.86 Nitrous oxide-piped systems. A permit is required to install and maintain a nitrous oxide-piped system.

105.6.87 Occupant load increase. A permit is required to increase the occupant load of an assembly occupancy. The maximum increase shall be 10% when egress, seating, etc. remain in compliance with this code. This permit shall be for one event only.

105.6.88 Open flame. A permit is required for any open flame equipment.

105.6.89 Open flames and torches. A permit is required to remove paint with a torch; or to use a torch or open-flame device in a hazardous fire area.

105.6.90 Open flame on aircraft servicing ramp. An annual permit is required to use any open flame equipment on an aircraft fuel service ramp.

105.6.91 Organic coatings. A permit is required for any organic-coating manufacturing operation producing more than one gallon (4L) of an organic coating in one day.

105.6.92 Ovens (industrial baking or drying). A permit is required for operation of industrial ovens regulated by Chapter 21.

105.6.93 Ozone generator. A permit is required to install and operate an ozone generator.

105.6.94 Pallet storage. A permit is required for indoor or outdoor pallet storage exceeding 2,000 square feet.

105.6.95 Parade floats. A permit is required for any parade float ground or airborne.

105.6.96 Places of assembly. A permit is required to operate a place of assembly.

105.6.96.1 Occupant load > 150 but < 299

105.6.96.2 Occupant load 300 - 2500

105.6.96.3 Occupant load > 2500

105.6.97 Plan review. A permit is required for plan review.

105.6.97.1 Development plan review – assessed in half-hour increments

105.6.97.2 Pre-plan submittal consultation – assessed in half-hour increments

105.6.97.3 HMIS, HMMP and hazardous materials generation

105.6.97.4 Expedited plan review – assessed in half-hour increments

105.6.97.5 Subsequent plan submittals – 3rd and subsequent submittals

105.6.98 Plastic foam products (flammable). A permit is required to store and use over 1,000 lbs.

105.6.99 Powder coating (See Spray booth, spraying and dipping).

105.6.100 Pressure vessels. A permit is required to install and use a pressure vessel.

105.6.101 Private fire hydrants. See Fire hydrants and valves.

105.6.102 Pyrophoric materials. A permit is required to store or use pyrophoric materials.

105.6.103 Pyrotechnic special effects material. A permit is required for use and handling of pyrotechnic special effects material.

105.6.104 Pyrotechnic event. A permit is required for all pyrotechnic events

105.6.104.1 After-hours inspection

105.6.104.2 Use of fog machine

105.6.104.3 Indoor/Outdoor pyrotechnic event.

105.6.104.4 Use of propane effects.

105.6.104.5 Pyrotechnic inspector during event. (Paid by promoter as after-hours inspection)

105.6.105 Pyrotechnician. A permit/certificate of fitness is required for all pyrotechnicians.

105.6.106 Pyroxylin plastics. A permit is required for storage or handling of more than 25 pounds (11 kg) of cellulose nitrate (pyroxylin) plastics and for the assembly or manufacture of articles involving pyroxylin plastics.

105.6.107 Radioactive material. A permit is required to store, use or handle radioactive material.

105.6.108 Recycling facilities. A permit is required to operate a recycling facility.

105.6.109 Refrigeration equipment. A permit is required to operate a mechanical refrigeration unit or system regulated by Chapter 6.

105.6.110 Repair garages and motor fuel-dispensing facilities. A permit is required for operation of repair garages and automotive, marine and fleet motor fuel-dispensing facilities.

105.6.111 Reviewing stands/grandstands. A permit is required to erect and use reviewing stands or grandstands.

105.6.112 Salvage yard. A permit is required to operate a salvage yard, not including other permits required by this code.

105.6.113 Service station. A permit is required for operation of repair garages and automotive, marine and fleet motor fuel-dispensing facilities. Fuel calculated and assessed separately.

105.6.114 Service station – Fleet/Private service. A permit is required for operation of fleet or private service stations. Fuel calculated and assessed separately.

105.6.115 Special conditional permit. A permit is required for special conditions, such as concealed spaces, vacated areas, abandoned tanks, etc.

105.6.116 Special events. A permit is required for special events.

105.6.116.1 Places of assembly – any hazardous material or process at temporary events

105.6.116.2 Places of assembly – refueling operations at temporary events in assembly occupancies

105.6.116.3 Places of assembly – storage, use and handling of flammable/combustible liquids at temporary events

105.6.116.3 Event within existing facility

105.6.116.4 Plan submittal less than 14 days prior to event

105.6.116.5 Outdoor with six ormore fuel-fired cooking/heating units

105.6.117 Special extinguishing system. A permit is required to install and maintain a special extinguishing system.

105.6.118 Special fire alarm system. A permit is required to install and maintain a special fire alarm system.

105.6.119 Special spray application projects. A permit is required for applying flammable or combustible finishes to the interior of a structure.

105.6.120 Spray booth / powder coating. A permit is required to install and use a spray booth or powder coating booth.

105.6.121 Spraying or dipping. A permit is required to conduct a spraying or dipping operation utilizing flammable or combustible liquids or the application of combustible powders regulated by Chapter 15.

105.6.121.1 One time/one location

105.6.121.2 Annual/various locations

105.6.121.3 Spraying of water-based finishes

105.6.121.4 Per booth

105.6.122 Storage containers.

105.6.122.1 Temporary – less than 180 days

105.6.122.2 Permanent – 180 days or longer

105.6.123 Storage of scrap tires and tire by-products. A permit is required to establish, conduct or maintain storage of scrap tires and tire byproducts that exceeds 2,500 cubic feet (71 m^2) of total volume of scrap tires and for indoor storage of tires and tire byproducts.

105.6.124 Storage tanks.

105.6.124.1 Flammable/combustible dispensing system – install, repair, alter, upgrade (per tank)

105.6.124.2 Flammable/combustible – remove or abandon in place (annual fee/per tank)

105.6.125 Stored electrical energy emergency/standby power systems. A permit is required to install or operate stored electrical energy emergency/standby power systems.

105.6.126 Sulphur/sulphur chloride. A permit is required to store, sell or use sulphur or sulphur chloride.

105.6.127 Supervising station/central station. A permit is required to receive fire alarm signals from a protected property.

105.6.128 Tanks (Change of content). A permit is required to change the contents of a chemical or fuel storage tank.

105.6.129 Temporary fire standpipe. A permit is required to install and maintain a temporary fire standpipe.

105.6.130 Temporary generator. A permit is required to use a temporary generator.

105.6.131 Temporary heating appliance. A permit is required to install or use a temporary heating appliance.

105.6.132 Temporary membrane structures. A permit is required to operate an air-supported temporary membrane structure or a tent having an area in excess of 200 square feet (19 m^2) or in excess of 400 square feet (37 m^2).

105.6.133 Tents or air-supported structures. A permit is required for tents or air-supported structures.

105.6.133.1 An area in excess of 150 sq. ft. but < 700 sq. ft.

105.6.133.2 An area in excess of 700 sq. ft.

105.6.134 Tire rebuilding/recapping plants. A permit is required for the operation and maintenance of a tire rebuilding or recapping plant.

105.6.135 Tire storage. A permit is required for tire storage exceeding 2500 cubic ft. in any one control area.

105.6.136 Trailer. A permit is required for trailers used for office functions.

105.6.136.1 Temporary – less than 180 days

105.6.136.2 Permanent – 180 days or longer

105.6.137 Training fees. A permit is required for Fire Department training.

105.6.137.1 Hi-rise building evacuation exercise

105.6.137.2 Low-rise building evacuation exercise

105.6.137.3 Building management/facility manager emergency procedures certification training (per person)

105.6.137.4 Fire extinguisher training (2 hours – does not include extinguisher; limited to 5 persons)

105.6.137.5 Floor warden training (limited to 5 persons)

105.6.137.6 Hazardous materials closure plan

105.6.137.7 Hazardous materials waste generation plan

105.6.137.8 Hazardous materials inventory statement training (2 hours; limited to 5 persons)

105.6.137.9 Hazardous materials management plan (2 hours; limited to 5 persons)

105.6.137.10 Hazardous materials release mitigation training (2 hours; limited to 10 persons)

105.6.137.11 Safety and evacuation training (2 hours; limited to 10 persons)

105.6.137.12 Fire safety public education presentation

105.6.138 Underground hazardous material storage tanks. A permit is required to install and maintain an underground hazardous material storage tank (per tank).

105.6.139 Underground spaces. A permit is required to inspect and certify underground spaces.

105.6.140 Varnishes. A permit is required to store ore use more than 100 gallons of varnish.

105.6.141 Waste material handling plant. A permit is require to operate waste material handling plants, wrecking yards, junk yards and waste material-handling facilities.

105.6.142 Waste oil heaters. A permit is required to install or operate a waste oil heater.

105.6.143 Waste receptacles. A permit is required to install and maintain waste receptacles with a capacity greater than 20 cubic feet.

105.6.144 Waxes. A permit is required to store, sell or use more than 400 lbs. of wax.

105.6.145 Wood products. A permit is required to store more than 200 cubic ft. of wood products.

105.6.146 Wooden packing boxes, cases and barrels (empty). A permit is required to store more than 2,000 cubic ft.

105.6.147 Woodworking operations. A permit is required to install and operate a woodworking operation.

SECTION 106
INSPECTIONS

Add Sections as follows:

106.2.1 Dangerous or hazardous conditions or material. The fire code official shall have the authority to order any person(s) to remove or remedy such dangerous or hazardous condition or material as set forth in this code. Any person(s) failing to comply with such order shall be in violation of this code.

106.2.2 Right of entry. The fire code official shall be authorized to inspect any building or premises for dangerous or hazardous conditions or materials as set forth in this code. Before entering, the fire code official shall obtain the consent of the occupant thereof or obtain a court warrant authorizing entry for the purpose of inspection except in those instances where an emergency exists.

106.2.3 Emergency. As used in 106.2.2, "emergency" means circumstances that the fire code official knows, or has reason to believe, exist and can constitute immediate danger to life and property.

106.2.4 Authorized Personnel. Uniformed fire inspectors, fire investigators, and fire protection engineers shall be authorized to enter and inspect buildings, structures, vessels, vehicles, and premises as herein set forth. They shall be identified by credentials issued by the Department of Safety.

106.2.4.1 Impersonation. Persons shall not use a badge, uniform, or other credentials to impersonate the fire code official.

106.2.5 Hazardous Conditions. Where conditions exist and are deemed hazardous to life and property by the fire code official, the fire code official shall have the authority to summarily abate such hazardous conditions that are in violation of this code.

106.2.6 Plans and Specification. The fire code official shall have the authority to require plans and specifications to ensure compliance with applicable codes and standards. The plans and specifications shall bear the stamp of a professional engineer.

106.2.7 Inspection of construction and installation. The fire code official shall be notified by the person performing the work when the installation is ready for a required inspection or for fire protection or other life safety systems acceptance tests. All installations shall be complete prior to requesting an inspection or test. All components of a life safety system shall be installed prior to testing—no exceptions.

106.2.7.1 Work in violation. When any construction or installation work is being performed in violation of the plans and specifications approved by the fire code official, a written notice shall be issued to the responsible party to stop work on that portion of the work that is in violation. The notice shall state the nature of the violation, and no work shall be continued on that portion until the violation has been corrected.

106.2.8 Stop work or evacuation. The fire code official shall have the authority to order an operation or use stopped and the immediate evacuation of any occupied building, area of a building, or other property when such building, area of a building, or other property has hazardous conditions that present imminent danger.

106.2.8.1 Non-complying work. Whenever any work is being done contrary to provisions of this code, the fire code official is hereby authorized to order such work stopped. Such work should immediately stop until authorized by the fire code official to proceed.

106.2.9 Standby personnel. When, in the opinion of the fire code official, it is essential for public safety in a tent, canopy or membrane structure used as a place of assembly or any other use where people congregate, or any building, premises or property where people congregate, because of the number of persons, or the nature of the performance, exhibition, display, contest or activity, or when potentially hazardous conditions exist, or an occupant load varies due to large crowd movement from one building to another building or one area of a building to another area of the building, or there is a reduction in a life safety feature, or there is an impairment to a fire protection feature, the owner, agency or lessee shall employ and compensate through approved Department of Safety channels at a rate established by the Manger of Safety one or more firefighters of the City and County of Denver, as required by the fire code official. Such firefighter(s) shall be subject to the fire code official's orders at all times when so employed and shall be in uniform and remain on duty during the times such places are open to the public or when such activity is being conducted or, in the case of residential occupancies, whenever occupied.

106.2.9.1 Owner's responsibility. The owner, agent, or lessee shall employ standby fire personnel in an adequate number determined by the fire code official based on the potential hazard or reduction in a fire protection system or other life safety feature as described in Section 106.2.9, as required and approved, to be on duty. Such standby fire personnel or fire watch personnel shall be subject to the fire code official's orders at all times and shall be identifiable and remain actively on duty during the times such places are open to the public, when such activity is being conducted, or in residential buildings, whenever occupied.

106.2.10 Records. The Fire Prevention and Investigation Division shall retain for not less than seven years a record of each inspection made showing the findings and disposition of each inspection made.

106.2.11 Townhouses and condominiums. Portable fire extinguishers shall be mounted on the exterior at each level stairway(s) or one (2A 10BC) within each residential unit. When mounted on the exterior, the property management/homeowner's association (HOA) shall be responsible for the care, maintenance and recharging, and use of the fire extinguisher, including inspection. The homeowner shall submit a report to the property management (HOA) on an annual basis. Portable fire extinguishers shall be inspected and maintained in accordance with NFPA 10. The smoke detector(s) within the residential units shall be tested and maintained in accordance with NFPA 72. The homeowner shall submit a report to the property management/HOA on an annual basis of each test and battery replacement. The property management/HOA shall maintain a log of the inspection/test reports submitted to that office and Denver Fire Department Inspection personnel will review that log prior to conducting the inspection. If this information is not available, an inspection shall be made to determine that this equipment is in compliance with this code.

Add Section 106.5 as follows:

106.5 Fees. The Manager of Safety is authorized to adopt an inspection fee schedule necessary to cover administrative costs of inspections and record-keeping under this code.

SECTION 107
MAINTENANCE

Add Sections 107.7 and 107.8 as follows:

107.7 Standby Personnel. The fire code official shall have the authority to require standby fire personnel or an approved fire watch when potentially hazardous conditions or a reduction in a fire protection system or other life safety feature exist due to the type of performance, display, exhibit, occupancy, contest, or activity; an impairment to a fire protection or other life safety system; or the number of persons present.

107.8 Owner's responsibility. The owner, agent, or lessee shall employ standby fire personnel in an adequate number determined by the fire code official based on the potential hazard or reduction in a fire protection system or other life safety feature as described in Section 107.7, as required and approved, to be on duty. Such standby fire personnel or fire watch personnel shall be subject to the fire code official's orders at all times and shall be identifiable and remain actively on duty during the times such places are open to the public, when such activity is being conducted, or in residential buildings, whenever occupied.

SECTION 108
BOARD OF APPEALS

Replace Section 108.1 as follows:

108.1 Board of appeals established. In order to hear and decide appeals of orders, decisions, or determinations made by the Fire code official relative to the application and interpretation of this Code, the Manager of Safety can hear the appeal alone or appoint a board of appeals consisting of members who are qualified by experience and training to make decisions pertinent to hazards of fire, explosions, hazardous conditions, flammable and combustible liquids and gases, the use, storage and production of hazardous materials, or fire protection and other life safety systems and features.

108.1.1 Application. Prior to any action by the Manager of Safety, an application in writing shall be filed in the office of the Manager within thirty (30) days after receiving the order, decision, or determination made by the fire code official on a form provided by the Manager providing the necessary information required. A copy of such application shall be furnished to the fire code official by the applicant. A fee of $100, in the form a check made payable to the Denver Manager of Revenue, must accompany the application.

108.1.2 Meetings and records. The Manager of Safety/Board of Appeals shall keep records of its proceedings showing the vote of each member on every question and the final decision.

108.1.3 Appeal from decision of the Manager of Safety. Any person aggrieved by a decision of the Manager of Safety may have judicial review of such decision as provided by law. A petition for review shall be filed in the court having jurisdiction within thirty (30) days after receiving the decision of the Manager of Safety.

SECTION 109
VIOLATIONS

Add Sections 109.2.2.1 through 1009.2.2.4 as follows:

109.2.2.1 Failure to comply. It shall be unlawful to violate any provisions of this code, or to fail to carry out an order made pursuant to this code or violate any condition attached to a permit, approval, or certificate, or to erect, install, alter, repair or do work in violation of approved construction documents, or without the appropriate license, permit or directive of the fire official. Violations shall be punishable as prescribed in Section 1-13(a) of the Denver Revised Municipal Code.

109.2.2.2 Time limits. Failure to comply with the time limits of an abatement notice or after a corrective order or notice of violation is issued by the fire code official shall result in each day that such violation continues being regarded as a new and separate violation and a new and separate offense.

109.2.2.3 Not owner-occupied. If the building or other premises is not owner occupied, under lease or otherwise, and the order or notice of violation requires additions or changes in the building or premises that would immediately become real estate and be the property of the owner of the building or premises, such orders or notices shall be complied with by the owner.

109.2.2.4 Citation. The fire code official is authorized to issue a citation to persons operating or maintaining an occupancy, premises, vessel, vehicle or other property subject to this code who allow a hazard to exist or fail to take immediate action to abate a hazard on such occupancy, premises, vessel, vehicle, or other property when ordered or notified to do so.

Replace Section 109.3 as follows:

109.3 Violation penalties. See Section 109.2.2.1 Failure to comply.

SECTION 110
UNSAFE BUILDINGS

Replace Section 110.1.1 as follows:

110.1.1 Unsafe conditions. Structures or existing equipment that are or hereafter become unsafe or deficient because of inadequate means of egress, or which constitute a fire hazard such as storage of explosives, excessive amounts of combustible or flammable materials, vegetation deemed an exposure hazard, manufacture of controlled substances, unstable material, hazardous materials, etc., or are otherwise dangerous to human life or to the public welfare, or which involve illegal or improper occupancy or inadequate maintenance, shall be deemed an unsafe condition. A vacant structure that is not secured against unauthorized entry shall be deemed unsafe. A structure, including residences, that constitutes a fire hazard and an exposure hazard in the event of fire or explosion shall be deemed unsafe. The fire code official is authorized to take action to mitigate an unsafe condition, rendering the operation harmless to people or property. The property owner shall be responsible for all costs related to all actions.

Add Section 110.1.2.1 as follows:

110.1.2.1 Unsafe heating or electrical equipment and structural hazards. When the fire code official deems any chimney, smokestack, stove, oven, incinerator, furnace, or other heating device, electrical fixture, or any appurtenance thereto, or anything regulated under a nationally recognized standard in or upon any building, structure, or premises not specifically mentioned in this code, to be unsafe or defective so as to create a hazard, the fire code official is authorized to serve upon the owner or the person having control of the property a written notice to remove or repair or alter as necessary. The fire code official is authorized to affix a condemnation tag prohibiting the use thereof, or until such repairs or alterations are made.

110.1.2.2 Unsafe operations. When the fire code official deems any operation, interior or exterior, to be unsafe so as to create a hazard, the fire code official is authorized to serve upon the owner, contractor, or the person having control of the property, a written notice to remove or repair or alter as necessary. The fire code official is authorized to affix a condemnation tag prohibiting the use thereof, or until such repairs or alterations are made. In the event that the unsafe operation resulted in an emergency response, legal action and cost recovery will be directed to the responsible party.

Add Section 112 as follows:

SECTION 112
LICENSES

112.1 General. A license is authority granted to the person to whom it is issued to perform the work authorized by the license.

112.2 Licenses required. Denver Fire Department licenses shall be required for the design, installation, modification, inspection, and testing of all Life Safety Systems and equipment. All fitters/technicians shall be licensed to design, install, add to, modify, and perform all types of inspections, testing, maintenance, and repair of factory-engineered equipment. All persons required to have a permit, license or certificates shall have a current—for calendar year—permit, license or certificate.

112.2.1 Fire sprinkler and standpipe systems.

112.2.2 Fire pumps.

112.2.3 Kitchen hood extinguishing systems.

112.2.4 Dry chemical extinguishing systems.

112.2.5 Carbon dioxide extinguishing systems.

112.2.6 Special extinguishing systems.

112.2.7 Fire alarm systems.

112.2.8 Fire detection systems.

112.2.9 Emergency communication systems.

112.2.10 Electrical signaling and central wiring.

112.2.11 Department of safety radio enhancement systems.

112.2.12 Smoke control systems.

112.2.13 Firefighter's emergency elevator recall systems.

112.2.14 Foam extinguishing systems.

112.2.15 Portable fire extinguishers.

112.2.16 Refrigerant safety / alarm systems.

112.2.17 Ammonia safety / alarm systems.

112.2.18 Carbon monoxide safety / alarm warning systems.

112.2.19 Clean agent fire extinguishing systems.

Add Section 113 as follows:

SECTION 113
PUBLIC FIRE EDUCATION

113.1 General. The fire code official shall have the authority to develop and implement a public fire safety education program as deemed necessary for the general welfare with respect to the fire hazards within the jurisdiction.

113.2 Educational programs and messages. The fire code official shall have the authority to ensure that duly authorized public fire safety educational programs or public fire safety messages are disseminated to the general public.

113.2.1 Juvenile firesetters intervention program. Juveniles suspected of firesetting—curious or malicious—shall be required to participate in the Denver Fire Department Juvenile Firesetters Intervention Program.

Add Section 114 as follows:

SECTION 114
EMERGENCY PLANS AND PROCEDURES

114.1 General. Where required, emergency plans, staff training, and emergency evacuation drills are required for all occupants.

114.2. Plan requirements. Emergency plans and emergency evacuation drills shall be developed in accordance with the Denver Fire Department Fire Prevention and Investigation Division's guidelines, NFPA 1600, *Standard on Disaster/Emergency Management and Business Community Programs*, and Chapter 4, Emergency Planning and Preparedness, of this code.

114.3 Review. Emergency plans shall be submitted annually to the Division for review.

114.4 Maintenance. Emergency plans shall be reviewed and updated annually. Revised plans shall be submitted for review and updates shall be provided whenever changes are made in the occupancy or physical arrangement of the building or fire protection systems or features. The owner or manager shall provide floor plans to the Denver Fire Department Fire Prevention and Investigation Division in a manner approved by the fire code official. The person developing/updating the emergency plans shall be certified by the Denver Fire Department. See IFCA Section 403.3.

Add Section 115 as follows:

SECTION 115
FIRE ALARM MONITORING - PERMITS AND LICENSES

115.1 General. The provisions of this section apply to the installation, operation of, and scope of monitoring.

115.2 Central alarm station / Supervising station. These facilities, licensed by the Denver Fire Department, monitor remote fire alarm signaling systems when personnel licensed by the Denver Fire Department are in attendance at all times to take such action as required for the notification of the Denver Fire Department.

115.3 Permits. Permits shall be obtained annually for central alarm station / supervising stations and the operators who take such action as required for notification of the Denver Fire Department. All central alarm station / supervising stations and operators shall have current—for current calendar year—permits and licenses.

115.4 Definitions.

CENTRAL ALARM STATION/SUPERVISING STATION. A facility that receives fire alarm signals and at which personnel are in attendance at all times to respond to these signals. A supervising station that is licensed for central station service.

CLASS I FIRE ALARM MONITORING. The monitoring of a fire alarm system by a licensed central station that is required by Denver's Building and Fire Codes.

CLASS II FIRE ALARM MONITORING. The monitoring of a fire alarm system by a licensed central station that is not required by Denver's Building and Fire Codes.

OPERATOR. A competent person employed by a central alarm station and licensed by the Denver Fire Department to take such action as required for notification of the Denver Fire Department.

RUNNER. A qualified person who responds to the location where a reported fire alarm system ahs been activated for the purpose of silencing, restoring, or confirming that the system is restored to a normal condition.

115.5 License required.

115.5.1 Central alarm station/supervising station. No person or public agency shall monitor fire alarm systems in the City and County of Denver without first obtaining a license to operate a Class I or Class II central alarm station/supervising station.

115.5.2 Operator. No person shall be employed as an operator in a central alarm station/supervising station that monitors fire alarm systems in the City and County of Denver unless licensed as an apprentice operator or operator by the Denver Fire Department.

115.5.2.1 Class I operator. A Denver Fire Department Class I Operator license shall authorize the holder to act as an operator in any central alarm station/supervising station.

115.5.2.2 Class II operator. A Denver Fire Department Class II Operator license shall authorize the holder to act as an operator in any Class II central alarm station/supervising station.

115.5.2.3 Apprentice operator. A Denver Fire Department Apprentice Operator license shall authorize the holder to act as an operator only under the constant supervision of a licensed operator.

115.5.3 Runner. A Denver Fire Department central alarm station/supervising station Runner license shall authorize the holder to act as a runner for any Class I or Class II central alarm station/supervising station.

115.6 Runner service. The central alarm station/supervising station shall provide runner service to all Class I alarms. Maximum response time from receipt of alarm to arrival of runner service shall not exceed 45 minutes.

CHAPTER 2
DEFINITIONS

SECTION 202
GENERAL DEFINITIONS

Add the following to definitions:

ALTITUDE. Altitude is the measure of elevation typically relative to sea level. The generally recognized altitude of Denver, CO is 5,280 ft. Altitude has a direct impact on design considerations for life safety and property protection including but not limited to the physical properties of flammable and combustible liquids. See Section 3401.5.1.

BIOHAZARD. See Section 2702.1.

CARCINOGEN. See Section 2702.1.

CENTRAL ALARM STATION/SUPERVISING STATION. Section 115.4.

CLASS I FIRE ALARM MONITORING. See Section 115.4.

CLASS II FIRE ALARM MONITORING. See Section 115.4.

EMERGENCY shall mean one or more of the following:

Fire, regardless of size or type

Explosion

Building, structure, or utility failure

Rescue operations involving humans or animals, including people trapped in elevators due to power failure or mechanical malfunctions

Failure of or damage to fire protection or life safety systems

Exposure to a hazard(s)

Panic

Hazardous material leak or spill

Overcrowding of any building or premises

Rescue operations involving humans or animals injured or trapped in buildings, trenches, scaffolding, grandstands, etc.

Any other hazard or situation involving or endangering life or property.

LOWEST LEVEL OF FIRE DEPARTMENT VEHICLE ACCESS. See Section 502.1.

NON-METALLIC RUBBISH CONTAINERS. See Section 304.3.2.1.

OPERATOR. See Section 115.4.

OTHER HEALTH HAZARD MATERIAL. See Section 2702.1.

PROPERTY. See Section 402.1.

RADIOACTIVE MATERIAL. See Section 2702.1.

RELEASE/UNAUTHORIZED DISCHARGE. See Section 2702.1.

RUNNER. See Section 115.4.

SENSITIZER. See Section 2702.1.

CHAPTER 3
GENERAL PRECAUTIONS AGAINST FIRE

SECTION 301
GENERAL

Replace Section 301.2 as follows:

301.2 Permits. Permits shall be required as set forth in IFCA Section 105.6 for the activities or uses regulated by IFC Section 303–Asphalt Kettles; IFC Section 304–Combustible Waste Material; IFC Section 306-Motion Picture Projection Rooms and Film; IFC Section 307-Open Burning and Recreational Fires; IFCA Section 308-Open Flames; Section 309-Powered Industrial Trucks and Equipment; Section 311-Vacant Premises; Section 314-Indoor Displays; and 315-Miscellaneous Combustible Materials Storage.

SECTION 304
COMBUSTIBLE WASTE MATERIAL

Add Section 304.2.1 as follows:

304.2.1 Required storage conditions. Combustible rubbish kept or accumulated within or adjacent to buildings, structures or residential dwelling units shall be in containers complying with this code, or in rooms or vaults constructed of non-combustible materials.

Exception:

Storage, accumulation, use and handling of combustible rubbish and waste, newspapers, magazines, etc. not in excess of 10 cubic feet aggregate.

Add Sections 304.3.2.1, 304.3.4, 304.3.5 and 304.3.5.1 as follows:

304.3.2.1 Non-metallic rubbish containers. Non-metallic rubbish containers exceeding 40 gallons capacity shall be manufactured of materials having a peak rate of heat release not exceeding 300 KN/m^2 when tested in accordance with nationally recognized standards. Such containers shall be permanently labeled indicating capacity and peak rate of heat release.

304.3.4 Removal. Combustible rubbish stored in containers outside of noncombustible vaults or rooms shall be removed from buildings at least once each working day.

304.3.5 Waste material handling operations. Occupancies exclusively performing commercial rubbish handling or recycling shall maintain rubbish or product to be processed or recycled as follows:

1. In approved vaults
2. In covered metal or metal-lined receptacles or bins, or
3. Completely baled and stacked in an orderly manner in an approved location.

304.3.5.1 Permits. A permit shall be required as set forth in Section 105.6 for a Waste Material Handling Plant.

SECTION 308
OPEN FLAMES

Replace Section 308.3.1 as follows:

308.3.1 Open-flame devices. No gas-fired grills, charcoal grills, or other similar devices used for cooking, heating, or any other purpose, shall be used or kindled on any balcony or under any overhanging portion or within 10 feet (3m) of any structure.

Exceptions:

1. One- and two-family dwellings.

2. LP-gas burners having an LP-gas container with a water capacity not greater than 2.5 pounds [nominal 1 pound (0.454kg) LP-gas capacity]. Two extra 1 pound LP-gas containers may be stored on the balcony.
3. Listed natural gas appliances shall be permitted on balconies when installed in accordance with the International Fuel Gas Code and supplied by the building's natural gas system.
4. Listed electric ranges, grills, or similar electrical apparatus shall be permitted.

Delete Section 308.3.1.1.

SECTION 309
POWERED INDUSTRIAL TRUCKS

Replace Section 309.2 as follows:

309.2 Battery charging operations. Battery-charging operations shall be located in areas designated for such purpose. Where on-board chargers are used, charging shall be accomplished at locations designated for such purpose.

309.2.1 Battery chargers. Battery chargers shall be of an approved type. Combustible storage shall be kept a minimum of 3 feet (915 mm) from battery chargers.

309.2.2 Battery-charging areas. Battery-charging areas shall be kept free of extraneous combustible materials. Battery charging shall not be conducted in areas accessible to the public.

309.2.2.1 Aggregate electrolyte capacity. For purposes of this section, and section 309.3, "aggregate electrolyte capacity" shall mean the total amount of electrolyte within one building. There shall be no maximum aggregate electrolyte capacity for any building, but when aggregate electrolyte capacity exceeds certain quantities, fire protection, construction and ventilation shall be required in accordance with this section.

309.2.2.2 Battery-charging area fire protection. Where aggregate electrolyte capacity exceeds 100 gallons, battery-charging areas shall be protected with an automatic sprinkler system per IFC Section 903.3.1.1.

Exception:

Automatic sprinklers shall not be required where the amount of electrolyte per battery-charging area is 100 gallons or less and the battery-charging areas are separated by a minimum of 75 feet.

309.2.2.3 Battery-charging area construction. Where aggregate electrolyte capacity exceeds 100 gallons, battery charging areas shall be separated from the other portions of the building with a one-hour fire barrier constructed in accordance with International Building Code Chapter 7.

Exceptions:

1. One-hour fire barriers shall not be required where the amount of electrolyte per battery-charging area is 100 gallons or less and the battery-charging areas are separated by a minimum of 75 feet.
2. In buildings that are protected throughout with an automatic sprinkler system per IFC Section 903.3.1.1., one-hour fire barriers shall not be required where the amount of electrolyte per battery charging area is 200 gallons or less and the battery-charging areas are separated by a minimum of 75 feet.

309.2.2.4 Smoking prohibited. Smoking shall be prohibited in battery-charging areas. "No Smoking" signs shall be provided in the charging area in accordance with Section 310.3.

309.2.2.5 Neutralization. An approved method and materials capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0 shall be provided.

309.2.2.6 Spill control. Each rack or tray of batteries shall be provided with a liquid-tight 4-inch minimum spill control barrier which extends at least one-inch beyond the battery rack in all directions. Alternative methods of spill control are subject to approval by the fire code official.

Exceptions:

1. Spill control shall not be required where the amount of electrolyte per battery-charging area is 100 gallons or less and the battery-charging areas are separated by a minimum of 75 feet.

2. In buildings that are protected throughout with an automatic sprinkler system per IFC Section 903.3.1.1., spill control shall not be required where the amount of electrolyte per battery charging area is 200 gallons or less and the battery-charging areas are separated by a minimum of 75 feet.

Replace Section 309.3 as follows:

309.3 Ventilation. Where aggregate electrolyte capacity exceeds 100 gallons, continuous ventilation shall be provided at a rate of not less than 1 cu-ft/min/sq. ft. of designated battery-charging area.

Exceptions:

1. Ventilation systems shall not be required where the amount of electrolyte per area is 100 gallons or less and the battery-charging areas are separated by a minimum of 75 feet.
2. In buildings that are protected throughout with an automatic sprinkler system per IFCA Section 903.3.1.1, ventilation systems shall not be required where the amount of electrolyte per battery charging area is 200 gallons or less and the battery-charging areas are separated by a minimum of 75 feet.

SECTION 315
MISCELLANEOUS COMBUSTIBLE MATERIALS STORAGE

Add new Section 315.3.3 as follows:

315.3.3 Outside storage of combustible material. Combustible material shall be piled with due regard to stability of piles and in no case higher than twenty (20) feet. When the area used for outside storage exceeds fifty (50) feet, but is less than one hundred fifty (150) feet, in any dimension, aisles of not less than eight (8) feet clear width shall be provided between piles. When the area used for outside storage exceeds one hundred fifty (150) feet in any dimension, a driveway between and around piles shall be at least fifteen (15) feet in width and maintained free of rubbish, equipment or other articles or materials. Driveways shall be so spaced that a maximum grid system unit of fifty (50) feet by one hundred fifty (150) feet is produced.

CHAPTER 4
EMERGENCY PLANNING AND PREPAREDNESS

SECTION 401
GENERAL

Delete the exception to Section 401.1 – Scope.

Replace Section 401.3 as follows:

401.3 Emergency forces notification. In the event an emergency, including but not limited to, unwanted fire, hazardous materials discharge, medical incident, or environmental calamity including utility malfunction, occurs on a property, the owner, occupant, or any other person in responsible charge of the property or portion thereof, including their tenants and employees, shall immediately report the emergency to 911. Building employees and tenants shall implement the appropriate emergency plans and procedures. No person shall, by any means, require or otherwise purposely cause any delay in the reporting of an emergency.

Add Section 401.3.4 as follows:

401.3.4 Evidence of emergency. Upon discovery of evidence of an unwanted fire, hazardous materials discharge, medical incident, or environmental calamity, even though it appears to have been extinguished or otherwise stabilized, the owner, occupant, or any other person in responsible charge of the property or portion thereof, including their tenants and employees shall immediately notify the Fire Department of the evidence including what is known of the location and circumstances. Such evidence shall not be disturbed, thus preserving data for the Fire Department to conduct an investigation.

Add Section 401.6 as follows:

401.6 False alarm. No person shall deliberately or maliciously report a fire or unauthorized discharge of hazardous materials when that person knows that no fire or discharge exists. The person responsible for the false alarm shall reimburse the City for the total cost of responding to the false alarm.

Add Section 401.7 as follows:

401.7 Misleading information. It shall be unlawful for a person to willfully make any false, fraudulent, misleading, or unfounded report or statement or to willfully misrepresent any fact with the intention of misleading any Fire Department personnel or interfering with Fire Department operations.

SECTION 402
DEFINITIONS

Add 'PROPERTY' definition to Section 402.1 as follows:

PROPERTY. As used in this chapter, shall include private and public land in the undeveloped and developed state including the buildings, structures, paving and all other immobile improvements; natural features such as trees, shrubbery and similar botanical growth; and vehicles, vessels, equipment, materials and similar movable items located on them.

SECTION 403
PUBLIC ASSEMBLAGES AND EVENTS

Replace Section 403.2.1 as follows:

403.2.1 Contents. The public safety plan, where required by Section 403.2, shall address:

- Emergency vehicle ingress and egress
- Fire hydrant locations
- Local fire protection (suppression and alarm)
- Emergency medical services
- Public assembly areas
- The directing of both attendees and vehicles (including the parking of vehicles)
- Vendor and food concession distribution
- The need for the presence of law enforcement
- Emergency procedures and employee training
- Fire and emergency medical services personnel at the event
- All other conditions possibly hazardous to life, property or public welfare in the occupancy

Add Section 403.3 as follows:

403.3 Facility manager certification. All personnel responsible for facility maintenance, fire safety emergency procedures, evacuation plans, evacuation drills, employee training and response procedures, hazard communication, resident training, tenant identification, emergency response team formulation and training, hazardous materials management plans, hazardous materials inventory statement, etc. shall complete a Denver Fire Department training course and shall have a current certification by the Denver Fire Department.

SECTION 404
FIRE SAFETY AND EVACUATION PLANS

Replace Section 404.3 as follows:

404.3 Contents. Fire safety and evacuation plan contents shall be in accordance with Sections 404.3.1, 404.3.2, and Denver Fire Department policy on Emergency Procedures and Emergency Evacuation.

Replace Section 404.3.1, Item 1 as follows:

1. Emergency egress or escape routes and whether evacuation of the building is to be complete or, where approved, by selected floors or areas only. Specifically address people with special needs.

Replace Section 404.3.2, Item 2 as follows:

2. The life safety strategy and procedures for notifying, relocating or evacuating occupants including those with disabilities. Provide a description of the building's life safety systems including fire alarm, fire sprinkler (including special suppression, standpipes, fire pumps, etc.), smoke control, elevator recall, areas of refuge, emergency power, etc.

SECTION 405
EMERGENCY EVACUATION DRILLS

Replace Section 405.1 as follows:

405.1 General. Emergency evacuation drills complying with the provisions of this section shall be conducted as specified in Table 405.2 or when required by the fire code official. Drills shall be designed in cooperation with the local authorities. Complete evacuation from the building of all persons required to participate is required. It shall be unlawful to refuse to participate or to interfere with Fire Department personnel conducting an emergency evacuation drill.

Replace Table 405.2 as follows:

TABLE 405.2
FIRE AND EVACUATION DRILL FREQUENCY AND PARTICIPATION

GROUP OR OCCUPANCY	FREQUENCY	PARTICIPATION
Covered Mall Building[a, b]	Annually	Employees
High Rise[a]	Annually	All occupants
A[b]	Quarterly	Employees
B[b]	Annually	All occupants
E	Monthly[c]	All occupants
H	Annually on each shift	All occupants
I-1[d]	Quarterly on each shift	All occupants
I-2, I-3, I-4	Quarterly on each shift	Employees
M[b]	Semiannually on each shift	Employees
R-1	Quarterly on each shift	Employees
R-2[b]	Four annually	All occupants
R-4	Quarterly on each shift	Employees[d]

a. R-1, R-2, R-4, I-1, I-2, I-3, and I-4 use Frequency and Participation listed with those occupancies in Table 405.2; use High Rise Frequency and Participation for all other occupancies in High Rise buildings.
b. As listed in Section 404.2.
c. The frequency shall be allowed to be modified in accordance with Section 408.3.2.
d. Fire and evacuation drills in residential care assisted living facilites shall include complete evacuation of the premises in accordance with Section 408.10.5. Where occupants receive habilitation or rehabilitation training, fire prevention and fire safety practices shall be included as part of the training program.

Add Section 405.10 as follows:

405.10 Extent of Evacuation. Fire and evacuation drills shall include the complete evacuation from the building of all persons required to participate. It shall be a violation of this code to refuse to participate or to interfere with the Fire Department personnel conducting a fire and evacuation drill.

CHAPTER 5
FIRE SERVICE FEATURES

SECTION 502
DEFINITIONS

Amend Section 502.1 by adding the definition as follows:

LOWEST LEVEL OF FIRE DEPARTMENT VEHICLE ACCESS. The lowest level of Fire Department vehicle access shall be measured from the lowest elevation of any required Fire Department access road located no more than 30 feet from any exterior wall of the building.

Exceptions:

1. Where the access road is permitted to be farther than 30 feet from any exterior wall of the building, the lowest level of fire department vehicle access shall be measured from the lowest elevation of any required Fire Department access road located no more than 50 feet from any exterior wall of the building.
2. If any topography, waterway, non-negotiable grades or other similar conditions exist that preclude required Fire Department vehicular access, the fire code official is authorized to require additional fire protection systems as required by IFC Chapter 9.

SECTION 503
FIRE APPARATUS ACCESS ROADS

Replace Section 503.1.1, Exception #1 as follows:

1. Where a building is equipped throughout with an approved automatic sprinkler system installed in accordance with IFC Sections 903.1.1 or 903.3.1.2, the 150 feet dimension may be increased to 250 feet. Access into interior courtyards shall be provided from two remote locations and access points shall be comprised of breezeways not less than 6 feet wide and having a height not less than the first story of the building. Location shall be approved by fire code official.

Replace Section 503.2.1 as follows:

503.2.1 Dimensions. The fire apparatus access road shall have an unobstructed vertical clearance of not less than 13 feet, 6 inches. Fire apparatus access roads shall have an unobstructed width per Table 503.2.1-A, except for approved security gates in accordance with IFC Section 503.6.

TABLE 503.2.1-A
FIRE APPARATUS ACCESS ROADS

Type of Right of Way	Minimum Clear Width
Private or public streets serving single-family detached buildings or townhomes with alleys	16 feet
Private or public streets serving single-family detached buildings or townhomes, without alleys but with driveways that reach the street	16 feet
Private or public streets serving single-family detached buildings or townhomes, without alleys OR driveways that reach the street	18 feet
Multi-family buildings, two stories or less, 15 units maximum per building; buildings with interior corridor(s) and a fire standpipe system complying with City ordinance	20 feet
Multi-family buildings, three or more stories, 16 or more units	25 feet
Non-residential	25 feet
Cul de sac	90 feet in diameter
Hammerhead turnaround	20 feet wide by 90 feet long

Replace Section 503.2.3 as follows:

503.2.3 Surface. Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus and shall be surfaced so as to provide all-weather driving capabilities. Permanent fire access surfaces shall be asphalt, concrete, or an approved surface capable of supporting imposed loads of fire apparatus. Temporary fire access surfaces during construction may consist of a gravel road base or asphalt or other approved surface. See IBC, Chapter 16 for Fire Department apparatus loading.

Replace Section 503.2.4 as follows:

503.2.4 Turning radius. The required turning radius of a fire apparatus access road shall be 25 feet inside and 50 feet outside.

Replace Section 503.2.7 as follows:

503.2.7 Grade. The grade of the fire apparatus access road shall not exceed 5%. Maximum cross-slope shall be 0.04ft/ft slope from lip to crown.

Add Sections 503.6.1 and 503.6.2 as follows:

503.6.1 Width. Security gates across a fire apparatus access road shall be a minimum 16 feet wide.

503.6.2 Approved means of emergency operation. Security gates across a fire apparatus access road shall be openable by one of the following means:

1. Key box containing keys to gain necessary access, installed in an approved location. (See IFC Section 506.1)
2. An approved lock. (See Section 506.1.1)
3. A chain of ¼ inch maximum non-case hardened steel.
4. Emergency operation approved by fire code official.

SECTION 504
ACCESS TO BUILDING OPENINGS AND ROOFS

Replace Section 504.1 as follows:

504.1 Require d access. Exterior doors and openings required by this code or the IBC, Section 903.2.10, shall be maintained readily accessible for emergency access by the Fire Department. An approved access walkway (5 feet minimum width) leading from fire apparatus access roads to exterior openings shall be provided.

Exception:

A lesser width may be provided when approved by the fire code official.

Add Sections 504.1.1 and 504.1.2 as follows:

504.1.1 Secured gate width. Secured gates and barricades shall be a minimum of 3 feet wide.

504.1.2 Approved means of securing. Secured gates and barricades shall be openable by one of the following means:

1. Key box containing keys to gain necessary access, installed in an approved location. (See IFC Section 506.1)
2. An approved lock. (See IFC Section 506.1.1)
3. A chain of ¼ inch maximum non-case hardened steel.
4. Means of securing approved by fire code official.

Add Section 504.4 as follows:

504.4 Roof hatches on buildings four or more stories above grade. All required interior stair enclosures that extend to the roof in any building four or more stories above grade, shall have, at the highest point of the stair enclosure, an approved roof hatch openable to the exterior. The hatch shall be a minimum of 16 square feet (1.5 m^2) in area with a minimum dimension of 2 feet (610 mm).

Exception:

Roof hatches are not required on pressurized stair enclosures and on stair enclosures complying with IBCA Section 1009.11.1.

SECTION 507
HAZARDS TO FIRE FIGHTERS

Add Section 507.4 as follows:

507.4 Prohibitions. The following prohibitions shall apply to all fences, walls or retaining walls, regardless of height:

1. The use of barbed wire or any other sharp-pointed material as a fencing material or on top of fences or retaining walls is prohibited except when specifically approved by the Fire Department.
2. The use of electrically charged fences or on top of fences or retaining walls is prohibited, except when specifically approved by the Fire Department.

SECTION 508
FIRE PROTECTION WATER SUPPLIES

Replace Section 508.2 as follows:

508.2 Type of water supply. A water supply shall be connected to a reliable public water works system. All buildings classified by the IBC, Section 403 as a high-rise shall be provided with at least two (2) approved independent water supplies from a reliable public water works system.

Delete Section 508.2.1

Replace Section 508.2.2 as follows:

508.2.2 Water tanks. New water tanks for fire protection shall be prohibited.

Exceptions:

1. Water tanks for fire protection may be used for NFPA 13D sprinkler systems for existing buildings when all of the following criteria are met:

a. When approved by Denver Water and Denver Fire Department.

b. The building is two stories and less.

c. Total building area is less than 2000 ft^2.

d. When hydraulic calculations demonstrate that the existing domestic water supply cannot support the system sprinkler demand per NFPA 13D.

e. Occupants are able to evacuate independently in case of an emergency.

f. Tanks for fire protection shall be installed in accordance with manufacturer.

2. Existing water tanks for fire protection that were previously approved by the Fire Department. These tanks shall be inspected, tested and maintained in accordance with NFPA 25.

Replace Section 508.3 as follows:

508.3 Fire flow. Fire flow requirements shall be as determined in IFC Appendix B. Each new or existing fire hydrant as required per Appendix C shall be capable of providing not less than 1500 GPM at 20 PSI residual pressure.

Replace Section 508.5.1 as follows:

508.5.1 Where required. Fire hydrants shall be located in accordance with IFC Appendix C.

Replace Section 508.5.3 as follows:

508.5.3 Private fire service mains and water tanks. Private fire service mains and water tanks are not permitted except for existing systems previously approved by the Fire Department and as allowed in IFCA Section 508.2.2. Existing private service mains and water tanks shall be periodically inspected, tested and maintained in accordance with NFPA 25 at the following intervals:

1. Private fire hydrants (all types): Inspection annually and after each operation; flow test and maintenance annually.
2. Fire service main piping: Inspection of exposed, annually; flow test every five years.
3. Fire service main piping strainers: Inspection and maintenance after each use.

Replace Section 508.5.5 as follows:

508.5.5 Clear space around hydrants. A five-foot clear space around the circumference of fire hydrants shall be maintained except as otherwise required or approved.

SECTION 509
FIRE COMMAND CENTER

Replace Section 509.1 as follows:

509.1 Fire Command Center (FCC). All buildings classified by IBC Section 403 as a high-rise, shall be provided with an FCC in accordance with this section. The FCC shall be used for no other purpose unless approved by the Fire Department. Scale drawings of the FCC showing the location of all equipment and features, in plan and elevation views, shall be submitted for approval prior to installation.

509.1.1 Fire command center construction. The FCC shall be contained in a room separated from the remainder of the building by 1-hour fire resistive construction. The FCC shall be a minimum of 96sf (9 sq m) with a minimum dimension of 8 ft. (2.438m). The FCC shall be ventilated and equipped with a smoke detector and high-temperature sprinklers. FCC lighting and power outlets and all equipment shall be connected to an approved emergency power supply. No piping, ducts or equipment foreign to required fire operations shall be permitted to enter, pass through or be installed within the FCC.

509.1.2 Fire command center location. Unless otherwise approved by the Fire Department:

1. The FCC shall be located on the ground floor.
2. The FCC entrance shall be directly accessible and in immediate proximity to the main building entrance.

509.1.3 Fire command center equipment. The FCC shall contain the following:

1. Emergency voice/alarm communication system unit per IFCA Section 907.2.12.2.
2. Fire Department communication system per IFCA Section 907.2.12.3.
3. Fire detection and alarm control unit and annunciator per IFCA Sections 907.1.2.2 and 907.2.12.4.
4. Elevator status/Control panel per IFCA Section 907.2.12.15.1.
5. Firefighter's smoke control panel per IFCA Section 907.2.24.5
6. Manual controls for simultaneously unlocking stairway and refuge area doors per IBCA Appendix L.
7. Emergency generator panel per IFCA Section 907.2.12.7.
8. Telephone with controlled access to a public telephone network.
9. Fire pump remote status panel per IFCA Section 907.2.12.8.
10. Building as-built construction plans indicating typical floor and roof plans, detailing the building core, means of egress, fire protection system drawings, fire fighting equipment, Fire Department access, interior generator and utility shut-off locations. These drawings shall be protected from damage and immediately accessible to the Fire Department, and a storage rack to support these drawing shall be provided.
11. Building site plan with; "North" orientation, local street intersection, fire hydrants, Fire Department connections, building entries, exterior generator and fuel locations and exterior utility shut-off locations.
12. Work table 3' x 5' and chair.
13. Public address system equipment, where specifically required by other sections of this code.
14. A key vault approved by the Fire Department to house keys to access mechanical and electrical equipment.
15. Two-way communication required by IBC Section 1007.6.3; Appendix L, Section L106.1.7, Exception 3; and IBC Section 3001.2.
16. Multi-level lighting control. Separately switched lamps or dimming control is acceptable. Dimming of fluorescent fixtures shall be by EMI/RFI shielded devices.

Add Section 509.2 as follows:

509.2 Fire command room. A fire command room is required in covered mall buildings, special amusement building, and all Group A occupancies with a room with an occupant load of 1,000 or more. The fire command room shall be of 1-hour fire resistive construction. It shall be a minimum of 24ft^2 (2.23m^2) with a minimum clear dimension of 3ft (30.5cm) in front of the control equipment. The fire command room shall contain the following equipment, where required:

1. Emergency voice/alarm communication system
2. Smoke control panel, where provided
3. Generator status panel, where provided
4. Fire pump status panel, where provided

SECTION 510
FIRE DEPARTMENT ACCESS TO EQUIPMENT

Add Section 510.2 as follows:

510.2 Access to fire pumps. Access to fire pumps in new buildings constructed after adoption of the 2006 IFC shall be located at grade level with direct access to outside or located one level below grade. Pump rooms that are located one level below grade shall be placed such that there are no intervening rooms between the stairway door serving that level and the pump room. Door serving the pump room shall be within 25 ft of the stairway door. The stairway that serves the lower level shall exit directly to outside. Where a dedicated stairway is provided to access the pump room and mechanical rooms, stairway width shall not be less than 36 inches.

CHAPTER 6
BUILDING SERVICES AND SYSTEMS

SECTION 603
FUEL-FIRED APPLIANCES

Replace Sections 603.4 and 603.4.1 with the following:

603.4 Portable unvented heaters. Portable unvented fuel-fired heating equipment is prohibited within the City and County of Denver.

Replace Section 603.8.1 as follows:

603.8.1 Residential incinerators. Residential incinerators are prohibited within the City and County of Denver.

SECTION 604
EMERGENCY AND STANDBY POWER SYSTEMS

Replace Section 604.1 in its entirety as follows:

604.1 Installation. Emergency and standby power systems required by this code or the IBC shall be installed in accordance with this code, NFPA 110 and NFPA 111. Existing installations shall be maintained in accordance with the original approval.

604.1.1 Stationary generators. Stationary emergency and standby power generators shall be installed in accordance with NFPA 37, NFPA 70 *(National Electrical Code)*, NFPA 110 and NFPA 111 and listed per UL 2200. Emergency power systems shall be as defined in NFPA 70, Article 700 [NFPA 37 Type 10]. Standby power systems required by this or other adopted codes and standards of the local authorities having jurisdiction shall be as defined in NFPA 70, Article 701 [NFPA 37 Type 60]. Other standby power systems shall be as defined in NFPA 70, Article 702.

604.1.1.1 Fuel supply. Fuel systems for internal combustion prime movers of emergency and required standby power systems shall be an on-site diesel fuel supply. Optional standby power systems may be fueled from any approved source excluding Liquefied Petroleum Gas (LPG). Fuel storage and handling shall comply with this code.

604.1.2 Stored energy emergency or standby power systems. Stored energy emergency and standby power systems shall be installed in accordance with IFC Section 608 and NFPA 111.

Replace Section 604.2.1 as follows:

604.2.1 Group A occupancies. Emergency power shall be provided for emergency voice/alarm communication systems in Group A occupancies in accordance with IFCA Section 907.2.1.1.2.

Replace Section 604.2.2 as follows:

604.2.2 Smoke control systems. Emergency power shall be provided for smoke control systems in accordance with IFC Section 909.11.

Replace Section 604.2.3 as follows:

604.2.3 Exit signs. Emergency power shall be provided for exit signs in accordance with IBCA Section 1011.4.3.

Replace Section 604.2.6 as follows:

604.2.6 Accessible means of egress platform lifts. Emergency power in accordance with this section or ASME A18.1 shall be provided for platform lifts that are part of an accessible means of egress in accordance with IFC Section 1007.5.

604.2.6.1 Accessible means of egress two-way communication. Emergency power shall be provided for the two-way communication system that is part of an accessible means of egress in accordance with IFCA Section 1007.6.3.

Replace Section 604.2.14 as follows:

602.2.14 Covered mall buildings. Covered mall buildings exceeding 50,000 square feet (4,645 m^2) shall be provided with emergency power systems which are capable of operating the emergency voice/alarm communication system, the smoke control system for four adjacent zones per IFCA, Section 909.6, the fire pump and one accessible elevator.

Replace Section 604.2.15 as follows:

604.2.15 High-rise buildings. Emergency power, light and emergency systems in high-rise buildings shall comply with the requirements of IFCA Sections 604.2.15.1 through 604.2.15.3.

604.2.15.1 Emergency power. An emergency power system shall be provided. Where the emergency system is a generator set inside a building, the generator shall be located in a separate room enclosed with 2-hour fire barriers or horizontal assemblies constructed in accordance with the International Building Code, or both. System supervision with manual start and transfer features shall be provided at the fire command center. A generator set shall be located at grade level, or one level below grade, and the filling connection shall be located outside of the building.

604.2.15.1.1 Fuel supply. An on-premises fuel supply, sufficient for not less than 8-hour full-demand operation of the system, shall be provided.

604.2.15.1.2 Capacity. The emergency system shall have a capacity and rating that supplies all required equipment simultaneously.

Exception:

Elevator operation on emergency power shall comply with IFCA Section 604.2.15.1.3.

604.2.15.1.3 Connected facilities. Electrical power and lighting for the fire command center and all life safety systems equipment, elevators specified in IBC Sections 403.8 and 403.9, emergency egress lighting, exit signs, equipment installed to maintain fire protection systems at no less than 40°F (4°C), radio enhancement systems, electrically powered fire pumps, fuel transfer pumps for fire pump(s) and generator set(s), shall be capable of being powered by the emergency generator set simultaneously. Sufficient emergency power shall be provided to simultaneously operate two elevators for each group of elevators controlled by a common operation system. Additional emergency power shall be provided for the elevator car that has been designated to accommodate an ambulance stretcher as described in IBCA Section 3002.4 if this car is not included in one of the groups above and be transferable to any elevator.

Exception:

Sufficient emergency power shall be provided for only one elevator for each group of elevators controlled by a common operating system that serve only open parking levels of the high-rise building.

604.2.15.2 Separate circuits and luminaires. Separate lighting circuits and luminaires shall be required to provide sufficient light with an intensity of not less than 1 foot-candle (11 lux) measured at floor level in all means of egress corridors, stairways, smokeproof enclosures, elevator cars and lobbies, and other areas which are clearly a part of the escape route.

604.2.15.2.1 Other circuits. Circuits supplying lighting for the fire command center and mechanical equipment rooms shall be transferable to the emergency source.

604.2.15.3 Emergency systems. Exit signs, exit illumination as required by IFC Chapter 10, and elevator car lighting are classified as emergency systems and shall operate within 10 seconds of failure of the normal power supply and shall be capable of being transferred to the emergency source.

604.2.15.4 Fire pumps. An emergency power source shall be provided for electric motor driven fire pumps in accordance with NFPA 70 Article 700 and installed per NFPA 20 and NFPA 70, Article 695.

Replace Section 604.2.16 as follows:

604.2.16 Underground buildings. Emergency power systems in underground buildings covered in IBC Chapter 4 shall comply with IFC Sections 604.2.16.1 and 604.2.16.2.

604.2.16.1 Emergency power. An emergency power system complying with NFPA 70 shall be provided for emergency power loads as specified in Section 604.2.16.1.1.

604.2.16.1.1 Emergency power loads. The following loads are classified as emergency power loads:

1. Emergency voice/alarm communication systems
2. Fire alarm systems
3. Automatic fire detection systems
4. Elevator car lighting
5. Means of egress lighting and exit sign illumination as required by Chapter 10
6. Smoke control system
7. Ventilation and automatic fire detection equipment for smokeproof enclosures
8. Fire pumps
9. Elevators in accordance with IBC Section 3003

Add Section 604.2.19.5 as follows:

604.2.19.5 Two or more elevators in a high-rise building. Sufficient emergency power shall be provided to simultaneously operate two elevators for each group of elevators controlled by a common operating system. Additional emergency power shall be provided for the elevator car that has been designated to accommodate an ambulance stretcher as described in IBC Section 3002.4 if this car is not included in one of the groups above.

Exception:

Sufficient emergency power shall be provided for only one elevator for each group of elevators controlled by a common operating system that serves only open parking levels of the high-rise building.

SECTION 606
MECHANICAL REFRIGERATION

Replace Section 606.8 with the following:

606.8 Refrigerant detector. Machinery rooms shall contain a refrigerant detector with an audible and visual alarm. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values shown in the *International Mechanical Code* for the refrigerant classification. Detectors and alarms shall be placed in approved locations. Alarm notification devices shall be located on the interior and exterior of the machinery room. Refrigerant leak alarms shall be interconnected with the base building fire alarm system. The refrigerant alarm device shall be distinctly annunciated as a separate alarm zone at the building annunciator panel.

SECTION 608
STATIONARY STORAGE BATTERY SYSTEMS

Replace Section 608.5 as follows:

608.5 Spill control and neutralization. An approved method and materials for the control and neutralization of a spill of electrolyte shall be provided in areas containing lead-acid, nickel-cadmium or other types of batteries with free-flowing liquid electrolyte. Each rack of batteries or groups of racks shall be provided with a liquid-tight 4-inch (101.6mm) minimum spill-control barrier which extends at least 1-inch (25.4 mm) beyond the battery rack in all directions. For the purposes of this paragraph, a “spill” is defined as any unintentional release of electrolyte.

Exception:

VRLA, lithium-ion or other types of sealed batteries with immobilized electrolyte shall not require spill control.

CHAPTER 7
FIRE-RESISTANCE-RATED CONSTRUCTION

SECTION 704
FLOOR OPENINGS AND SHAFTS

Replace Section 704.1 as follows:

704.1 Enclosure. Existing interior vertical shafts, including but not limited to stairways, elevator hoistways, service and utility shafts, shall be enclosed and protected with assemblies and features specified in the building and fire codes, including applicable Modifications Under Special Circumstances and retrofit ordinances, under which the building or structure in which it is located was last certified for occupancy. Protection features and required fire-resistance ratings of existing enclosures shall be maintained.

New shaft enclosures shall comply with the International Building Code and IBCA except laundry and refuse chutes shall also comply with NFPA 82.

Delete Table 704.1.

CHAPTER 8
INTERIOR FINISH, DECORATIVE MATERIALS AND FURNISHINGS

SECTION 806
DECORATIVE VEGETATION IN NEW AND EXISTING BUILDINGS

Replace 806.1.1, Exception 1 as follows:

1. Trees located in areas protected by an approved automatic sprinkler system installed in accordance with IFC Sections 903.3.1.1 or 903.3.1.2 shall not be prohibited in Group M.

Add Section 806.6 as follows:

806.6 Natural combustible vegetation. Natural combustible vegetation is prohibited in A, E, I-3, R-1, R-2 dormitory, and R-4 occupancies.

Exception:

Limited quantities of natural combustible vegetation shall be permitted in these occupancies where the fire code official determines that adequate safeguards are provided based on the quantity and nature of the natural combustible vegetation. Flame resistance or flame retardance shall be demonstrated by each individual natural combustible vegetation item in an approved manner. The use of unlisted electrical wiring and lighting on natural combustible vegetation shall be prohibited

Replace Section 807.4.3.2 as follows:

807.4.3.2 Classroom artwork and teaching material. Artwork and teaching material attached directly to the school classroom walls shall be in accordance with the following provisions:

Classroom walls may be used to attach student artwork, other artwork, and teaching materials not to exceed fifty (50) percent of the area of each wall when the school is not protected throughout by an automatic fire sprinkler system and eighty (80) percent of the area of each wall when the school is protected throughout by an automatic fire sprinkler system. The area of each wall is defined as being the height from the floor to the ceiling multiplied by the length of the wall, excluding door and window openings. Artwork and teaching materials shall not be attached to any wall within eighteen (18) inches of the exit access door. Doors and windows, including window/view panels of interior exit access doors, shall not be covered. The use of crepe paper that is not listed as flame resistant is prohibited.

Exceptions:

1. Building interior finish materials (e.g., metal lockers).
2. Artwork or teaching materials that are listed as non-combustible.
3. Artwork or teaching materials that are contained within non-combustible containers or coverings (e.g., metal and glass display cases).

Add Section 807.4.3.3 as follows:

807.4.3.3 Exit corridor artwork and teaching materials. Artwork and teaching material attached directly to the school exit corridor walls shall be in accordance with the following provisions:

Exit corridor walls may be used to attach student artwork, other artwork, and teaching materials not to exceed thirty (30) percent of the area of each corridor wall when the school is not protected throughout by an automatic fire sprinkler system and sixty (60) percent when the school is protected throughout by an automatic fire sprinkler system. The area of each corridor wall is defined as being the height from the floor to the ceiling multiplied by the length of each wall, excluding door and window openings. Artwork and teaching materials shall not be attached to any wall within eighteen (18) inches of the exit access door. Doors and windows, including window/view panels of interior exit access doors, shall not be covered. The use of crepe paper that is not listed as flame resistant is prohibited.

Exceptions:

1. Building interior finish materials (e.g., metal lockers).
2. Artwork or teaching materials that are listed as non-combustible.
3. Artwork or teaching materials that are contained within non-combustible containers or coverings (e.g., metal and glass display cases).

Add Section 807.4.3.4 as follows:

807.4.3.4 Ceiling artwork and teaching materials. Artwork and teaching materials suspended from classroom and exit corridor ceilings shall be in accordance with the following provisions:

1. The total area of materials suspended from ceilings shall be deducted from the percent of wall space for classrooms and for exit or access corridors that artwork and teaching materials can be attached to in accordance with IFCA Sections 807.4.3.2 and 807.4.3.3.
2. Wires or cords used to suspend student artwork and teaching materials from the ceiling cannot be strung from corner to corner and cannot be strung parallel to any wall more than six (6) inches from the walls.
3. Display of student artwork and teaching materials on wires or cords perpendicular to exit corridor walls strung from corridor wall to corridor wall shall not form a continuous combustible curtain. There shall be a minimum clearance of seven (7) feet from the floor to the lowest portion of the display.
4. Display of student artwork and teaching materials shall not impair visibility or distract attention from the exit sign.
5. No material shall be attached to light fixtures; thermal or smoke detectors; exit signs; fire sprinkler piping, valves, or sprinkler heads, etc. The ceiling structure must be capable of supporting the student artwork and/or teaching materials.
6. The display of student artwork or teaching materials shall not obstruct or compromise in any manner the fire sprinkler or fire detection system.

CHAPTER 9
FIRE PROTECTION SYSTEMS

SECTION 903
AUTOMATIC SPRINKLER SYSTEMS

Add Exception to Section 903.1.1 as follows:

Exception:

Chapter 21 Section 21.20 in 2007 NFPA 13 shall be deleted.

Add Section 903.2.7.1 as follows:

903.2.7.1 Balconies. Sprinkler protection shall be provided for all balconies and ground floor patios of dwelling units of all construction types. Sidewall sprinklers that are used to protect such areas shall be located such that their deflectors are within 1 inch (25 mm) to 6 inches (152 mm) below the structural members, and a maximum distance of 14 inches (356 mm) below the deck, or as listed by the sprinkler manufacturer.

Exception:

Sprinklers are not required for noncombustible balconies where the balcony is not supplied by fuel gas and one of the following is met:

1. The roof or other overhead structure does not cover more than 50% of the entire balcony area; or,
2. The balcony has openings on two or more sides. The area of such openings must be at least 20 percent of the total perimeter wall area of the balcony. The aggregate length of the openings shall constitute a minimum of 40 percent of the perimeter of the balcony.

Add Section 903.2.7.2 as follows:

903.2.7.2 Townhouses. When two or more contiguous residential dwelling units constructed as townhouses, including those permitted under the International Residential Code, are protected by a single, monitored sprinkler system, that system shall be configured so flow is annunciated separately at the fire alarm control panel for each dwelling unit and each protected common area.

Amend Section 903.2.8.1 by adding Items #4 and #5 as follows:

4. Repair garages with a spray booth and/or a mixing area greater than 16 square feet utilizing flammable finishes.

   Exception:

   It is not necessary to install sprinklers throughout the entire building when replacing a previously-approved, existing booth.

5. Repair garages using open flame or welding of any type where the garage floor area exceeds 3,000 square feet.

Amend Section 903.3.1.1 by adding the following after the last sentence:

Exception:

Provisions of Section 903.3.1.1.1 shall not apply for new construction of elevator hoistways and machine rooms or spaces. New or retrofit elevators installed in existing buildings shall comply with Department policy. Where required by NFPA 13, hoistways and machine rooms/spaces shall be protected by 286 degree F sprinklers. Coverage shall be designed for Ordinary Hazard Group One. Sprinklers shall be supplied from a separate, independent branch line with a readily accessible indicating shut-off valve located outside the hoistway or room. Valves shall carry identification signs. Where machine room-less (MRL) elevator equipment is installed in an elevator hoistway, sprinkler protection shall be provided at the top of the shaft in all instances.

Amend Section 903.3.1.2 by adding the following after the last sentence:

Exception:

Where machine room-less (MRL) elevator equipment is installed in an elevator hoistway, sprinkler protection shall be provided at the top of the hoistway. Sprinklers shall be 286 degree F. Coverage shall be designed for Ordinary Hazard Group One. Sprinklers shall be supplied from a separate, independent branch line with a readily accessible indicating shut-off valve located outside the hoistway. Valves shall carry identification signs.

Replace Section 903.3.5.1 as follows:

903.3.5.1 Domestic service. Domestic service for water supply to automatic fire sprinklers for fire suppression shall be prohibited.

Exceptions:

1. Water supply for new NFPA 13D sprinkler systems. Refer to IFCA Section 508.2.2 for water tanks.
2. UL-300 listed fire suppression system in buildings that are not required by IFC Section 903 to be equipped with automatic sprinklers.

Delete Section 903.3.5.1.1

Delete Section 903.3.5.1.2

Replace Section 903.3.7 as follows:

903.3.7 Fire department connections. The location of fire department connections shall be field approved by the fire code official prior to installation.

Replace Section 903.4.2 as follows:

903.4.2 Alarms. Approved audible/visible devices (24 VDC supervised) shall be connected to every automatic sprinkler system. Such sprinkler water flow alarm devices shall be activated by water flow equivalent to the flow of a single sprinkler of the smallest orifice size installed in the system. Alarm devices shall be provided on the exterior of the building at least 10 feet above grade and within 25 feet of and visible from the fire department connections. Where a fire alarm system is installed, actuation of the automatic sprinkler system shall actuate the building fire alarm system.

SECTION 904
ALTERNATIVE AUTOMATIC FIRE-EXTINGUISHING SYSTEMS

Replace Section 904.3.5 as follows:

904.3.5 Monitoring. Where a building fire alarm system is installed, automatic fire-extinguishing systems shall be monitored by the building fire alarm system in accordance with IFCA Section 907.

904.3.5.1 Releasing panel. Alternative automatic fire-extinguishing systems shall be installed in accordance with IFCA Section 907.14.1.

SECTION 905
STANDPIPE SYSTEMS

Replace Section 905.1 as follows:

905.1 General. Standpipe systems shall be provided in new buildings and structures in accordance with this section. Fire hose threads used in connection with standpipe systems shall be approved and shall be compatible with Denver Fire Department hose threads – 2.5-inch hose thread is national standard; 1.5-inch hose thread is a special 11.5 threads per inch. The location of Fire Department hose connections shall be approved by the fire code official. Standpipe valve outlets, including ancillary equipment (PRVs, drains, etc.) shall not reduce the required width of stairway.

905.1.1 Standpipe hose outlets. Each outlet shall have a cap and chain. Outlets shall be at least 36 inches and not more than 52 inches above finished floor. The valves shall have no less than 3 inches clearance around control valve and outlet cabinet shall not impede attachment of hose.

Replace Section 905.2 as follows:

905.2 Installation standard. Standpipe systems shall be installed in accordance with this section and NFPA 14. When water pressure at a standpipe outlet exceeds 175 psi residual at 250 gpm flow, a pressure-reducing valve shall be provided. The required pressure-reducing valves shall be located at the hose valve outlet. The pressure-reducing valves shall not be located on the standpipe riser. Only field-adjustable valves that have a nested spring design utilizing two custom springs allowing low torque field adjustment of the pressure-reducing functions shall be allowed. The valve shall have five (5) field-adjustable valve settings (A-E) on a color-coded indication label. Pin-in hex security screws shall be installed to secure the hand wheel and a high-impact plastic shield covering the pressure-reducing adjustment mechanism. A pin-in hex bit shall be supplied with each valve. The pressure adjustment mechanism shall be actuated using an aluminum adjustment rod provided with each valve and actuated by rotating in either a clockwise or counter-clockwise direction. Pressure gauge taps shall be provided on inlet and discharge sides of each valve. A reflective decal shall be installed on the high-impact plastic shield with arrows and words indicating the direction to increase or decrease pressure. If special tools are required to make field adjustments, a minimum of four (4) such tools shall be provided at locations approved by the Fire Department.

Replace Exceptions in Section 905.3.1 as follows:

1. Class I standpipes are allowed in buildings equipped throughout with an automatic sprinkler system in accordance with IFC Sections 903.3.1.1 or 903.3.1.2 subject to the provisions of IFCA Section 913.
2. Class I automatic dry standpipes are allowed in single use or mixed-use open parking garages in accordance with IFCA Section 913.6(2) where the highest floor is located not more than seventy-five (75) feet above the lowest level of Fire Department vehicle access. In a mixed-use parking garage, the standpipe system serving the open parking garage shall be integrated with the fire protection system serving the other occupancies, and not be a stand-alone system. Hose connections shall be located as required for Class II standpipes in accordance with IFC Section 905.5.
3. Class I manual dry standpipes are allowed in single use open parking garages where the highest floor is less than 55 feet from the lowest level of Fire Department vehicle access. Hose connections shall be located as required for Class II standpipes in accordance with IFC Section 905.5. This provision is applicable to open parking garages with one level of underground enclosed parking garage.
4. Class I standpipes are allowed in basements equipped throughout with an automatic sprinkler system.
5. Intentionally deleted.

Delete Section 905.3.4.1 Hose and cabinet.

Delete Section 905.5.3 Class II system 1-inch hose.

SECTION 906
PORTABLE FIRE EXTINGUISHERS

Amend Section 906.1 by deleting Exception to Item #1.

Add Section 906.2.1 as follows:

906.2.1 Verification of service collars. Every portable fire extinguisher, regardless of type, shall have a verification of service collar in accordance with NFPA 10 Section 7.3.3.2. Only collars available at the Denver Fire Department are allowed. Collars shall not be cut.

Add Section 906.3.1 as follows:

906.3.1 Distribution in R-1 and R-2 occupancies. In R-1 and R-2 occupanices with entrances to dwelling units opening to outside, the maximum travel distance to a fire extinguisher from any point in the occupancy shall be placed no more than 75 feet. Alternatively, fire extinguishers may be placed inside each dwelling unit when approved by the Fire Department.

SECTION 907
FIRE ALARM AND DETECTION SYSTEMS

Replace Section 907.1 as follows:

907.1 General requirements. This section covers the application, installation, performance and maintenance of fire alarm systems and their components. Fire alarm systems, automatic fire detectors, emergency voice/alarm communication systems and notification devices shall be designed, installed and maintained in accordance with NFPA 72. Installation system wiring shall also be in accordance with NFPA 70 (*National Electrical Code*) and NFPA 72 (*National Fire Alarm Code)*.

907.1.1 Construction documents. Construction documents for fire alarm systems shall be submitted for permit application as a deferred submittal per IBCA Section 154. Document review and approval is required prior to issuance of a permit for system installation. Two sets of scaled, engineered installation shop drawings shall be submitted. Documents shall be of sufficient clarity and detail to fully describe the scope of work. Handwritten notes and comments on reproduced drawings are not acceptable. Documents shall include, but are not limited to, the following as applicable:

1. Completed permit application with exact address, location of work, name and address of responsible design agency and original seal and signature of the design professional.
2. Building occupancy classification and occupant load for each occupancy classification.
3. Manufacturers' specification sheets for all equipment and devices.
4. Code reference used as a basis of design, including any administrative modifications or Board of Appeals decisions.
5. Identification of system as code-required, non-required code-compliant or user-defined.
6. Voice message content and language(s) for voice evacuation systems.
7. Complete sequence of operation including:
    a. Elevator recall
    b. Smoke control
    c, HVAC system shutdown
    d. Alarm conditions
    e. Trouble and supervisory conditions
    f, Emergency voice/alarm communication system
    g. Two-way firefighter's voice communication system in accordance with IFCA Section 907.2.12.3.
    h. Special systems, e.g., dry/pre-action sprinkler systems, clean agent suppression systems, kitchen hoods, laundry and trash chutes, etc.
    8. Identification of air-handling units with airflow exceeding 2,000 cfm (.94cu m/s) and 15,000 cfm (7.08cu m/s).
9. Identification of air-handling units used for smoke control.
10. Voltage-drop calculations using either the device-by-device method or where the entire load is lumped at the end of the circuit. The calculations shall use the listed RMS current draw at 20.4volts for new systems. The voltage on a circuit shall not drop below 16 volts at the last appliance. The "R" values used for conductors shall be per NFPA 70 (NEC) for uncoated copper conductors. Voltage-drop calculations for additional devices on existing system shall be done in the same manner with the same values, as the original calculations for the system.
11. Battery calculations for control panels and power supplies. Calculation to include 20% de-rating.
12. Scale drawings of each area where work on the fire alarm is to be performed, including north arrow, building address and local street intersections. The drawings shall show location of all equipment and devices, including existing devices and end-of-line resistors, room identification by number and function (as applicable), attic and ceiling details for areas with automatic detection.
13. Mounting heights of wall mounted devices.

14. Symbol list with quantities of each device. Symbols shall comply with NFPA 170, *Standard for Fire Safety Symbols*.
15. Power supply connection details. System single line riser showing all devices.
16. A separate single line drawing of the pre-amps, amplifiers, interconnecting wiring, and methods used to provide survivability of the voice communication system.
17. Fire alarm circuit identification, in accordance with NFPA 72, including wire color code.
18. Interconnection wiring.
19. Central station designation.
20. Full-scale drawings of annunciators, zone maps and firefighter's smoke control panels.
21. Reflected ceiling plan, where full smoke detection is provided.
22. Conduit-fill calculations

Exceptions:

1. A permit may be issued for fire alarm "conduit only rough-in" without approved plans. A "conduit only rough-in" permit may be issued to a contractor with either an electrical or electrical signal contractor's license. This permit shall not authorize installation of any system devices. The "conduit only rough-in" permit applies to device back boxes and conduit stubs. The contractor shall be responsible for any changes required by the Department plan review.
2. Fire alarm "walk-thru" permits may be issued in accordance with the following:
   a) Circumstances in which permits may be requested:
      1. New devices or appliances connected to existing fire alarm systems in other than Group H and I occupancies. Installation shall be limited to a maximum of twelve notification appliances (audible and/or visible) and/or six initiating devices. Initiating devices connected to access control systems, or installed in battery rooms, are not permitted for "walk-thru."
      2. Transferring existing monitoring companies to a new provider and new dialer.
      3. Emergency fire alarm panel replacement for existing system. The panel shall be compatible and functional to the panel being replaced.
   b) Limitations:
      1. Hours: Monday through Friday from 7:30 to 11:30 a.m. (except for holidays).
      2. Maximum number of permits reviewed or issued shall be limited to three per day per contractor.
   c) Two sets of shop drawings shall be provided. The shop drawings submission shall include the following as applicable:
      1. Completed permit application.
      2. Building code occupancy classification.
      3. Manufacturers' specification sheets and equipment listing sheets for new equipment and devices.
      4. Installation codes and standards used.
      5. Type of system and reason system is provided (required, non-required).
      6. Sequence of operation.
      7. Identification of duct detectors in air-handling units exceeding 2,000 cfm (.94cu m/s) (not required in VAV boxes less than 2000cfm (.94cu m/s) each, but aggregate air flow exceeding 2000cfm (.94cu m/s) boxes served by central fan system).
      8. Voltage drop calculations and battery calculations.
      9. Description of annunciation assignments (complete zone schedule).

10. Shop drawings, drawn to scale, including a drawing for each building level involved, with a north arrow for compass orientation and depicting all control and annunciation panels and peripheral devices. Shop drawings shall bear the seal and signature of a Professional Engineer licensed by the State of Colorado or NICET Level III.
11. Plan for upgrading existing annunciator panel, if applicable.
12. 1-line diagram showing scope of work and identifying new devices
13. Site address, identification of each room's usage, and areas having automatic detection.
14. Provide building details (i.e., attics, ceiling cavities, etc.).
15. Mounting heights for manual fire alarm boxes and strobes.
16. Primary power supply connection details and symbol list.

907.1.2 Equipment. Systems and their components shall be listed and approved for the purpose for which they are installed. Installation locations of all control panels and annunciators are subject to field approval by the Fire Department. Keys for all equipment required to be accessible to the Fire Department shall be maintained in an approved location per IFC Section 506. All components shall be compatible with the system in which installed.

907.1.2.1 Connections to other systems. A fire alarm system shall not be used for any purpose other than fire warning or as specifically approved (e.g. pool alarm, access control release per IBCA, elevator recall and shunt trip, and emergency alarms per IFCA Section 907.2.5.1).

907.1.2.2 Control units, annunciator panels and access keys. All fire alarm control units and annunciator panels shall be UL 864 listed or equivalent. Locations should be within 10' (3.048m) of the main building entrance, unless specifically approved for an alternate location, and are subject to field approval prior to installation. Installation shall comply with NFPA 72. Access keys to locked fire alarm equipment shall be maintained in an approved location. Fire alarm control units shall not be equipped with a key or special numeric code to access system reset and silence functions. Access to the reset and silence operator interface shall be secured behind a locked door. Field modification of control units or annunciators is not permitted. System zone and device disable functions shall not be accessible without a maintenance-level access code. Alarm signals shall be protected from unauthorized deactivation. This applies to disconnection of the panel alarm transmission to the monitoring station and the alarm output circuit(s) to notification appliances. Deactivation shall only be allowed by Fire Department personnel or authorized entities responsible for system testing and maintenance. Any system deactivation shall be reported to the monitoring station and the Fire Department. Facilities whose systems are estimated to be deactivated for 10 hours or more shall be provided with a fire watch.

Exception:

In existing buildings undergoing a panel replacement, remote annunciators with silence and reset functions may be provided when approved by the Fire Department. These units shall not be equipped with "enable/disable" switches and shall be contained behind a transparent, lockable cover.

907.1.3 Central station connection. All fire alarm systems required by this code or by special agreement shall be monitored by an approved Class I central station (as defined in the Denver Municipal Code) licensed by the Denver Fire Department. Multiple central station connections from one building are not permitted. Alternatively, Fire Department radio boxes may be installed at locations approved by the Fire Department. These boxes shall typically be installed at locations of high-hazard, high occupancy that require immediacy of response due to limitations in the occupants' capabilities for self-preservation. Under no circumstances shall a radio box be removed from a protected premise without written approval of the Fire Department.

907.1.4 Multiple systems in a single building. Only one system shall be installed per building. Multiple points of silence and reset are prohibited on a single system.

Exceptions:

1. When permitted by the Fire Code official, portions of a building separated by fire walls without openings and identified with separate legitimate addresses are allowed to be considered separate buildings. When protected by an automatic sprinkler system, each portion of the building so considered shall be protected by a separate independent sprinkler system or a portion of a single sprinkler system dedicated to the separated portion of the building.

2. Multiple points of silence and reset as allowed by Section 907.1.2.2.

907.1.5 Problematic systems. Fire alarm and detection systems that generate two (2) or more unintentional false alarms within twenty-four (24) hours, three (3) or more within thirty (30) days, or ten (10) or more within one year shall be immediately repaired or replaced as necessary. A fine will be imposed for any unintentional false alarms exceeding ten within one year. A permit must be obtained for all work.

907.1.6 Systems out of service. Systems undergoing maintenance or modification shall not have any portion of the system out of service for more than ten hours. During maintenance or modification, all manual pull stations and notification appliances shall remain operational. Fire watch must be provided to all areas of the building where maintenance or modification will place any portion of the system out of service. Tenant finish operations shall be in accordance with Building and Fire Department policy.

Replace Section 907.2.1.1 as follows:

907.2.1.1 Group A occupancies with an occupant load of 1,000 or more.

907.2.1.1.1 Activation of the fire alarm in Group A occupancies with an occupant load of 1,000 or more per space, or an occupant load of 300 or more per space and with a cumulative Group A occupant load of 1000 or more, shall immediately initiate an approved prerecorded message announcement using an approved emergency voice/alarm communication system in accordance with IFCA Section 907.2.12.2 as applicable. In very high noise areas, such as theaters, night clubs, ballrooms and dance halls, the system shall be designed to reduce or eliminate the background noise upon alarm initiation.

Exception to remain.

907.2.1.1.2 Emergency power. Emergency voice/alarm communication system shall be provided with an approved emergency power source in accordance with NFPA 72.

907.2.1.1.3. Annunciation. If required by other sections of this code**,** point-lit graphic annunciation shall be provided.

907.2.1.1.4. **Illumination of means of egress.** Illumination levels shall comply with IFC Section 1006.2 and be interfaced to the fire alarm control unit as required.

Delete Section 907.2.1.2.

Replace Section 907.2.2 Exceptions as follows:

1. Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system and the alarm notification appliances will activate upon sprinkler water flow. At least one manual pull box shall be installed at an approved location.
2. Buildings more than four stories in height constructed prior to the adoption of this code.

Replace Section 907.2.3 as follows:

907.2.3 Group E. Group E occupancies shall be provided with an approved manual fire alarm and automatic detection system throughout the occupancy. See also IFC Section 907.2.1.

Exceptions:

1. If less than 50 occupants, the system is not required to be monitored by a central station.
2. A manual fire alarm system is not required if 20 or less occupants and 120v AC single- or multiple-station residential smoke detectors with battery back-up, wired to an un-switched source is provided.
3. In mixed occupancies where the E occupancy is accessory to the A occupancy, a manual fire alarm system is not required in the A occupancy except as identified in IFC Section 907.2.1. Any exit paths for the E occupancy through the A occupancy shall be provided with automatic fire detection.
4. Manual fire alarm boxes are not required throughout the building where all the following apply:
   a. Interior corridors are protected by smoke detectors.
   b. System central station monitoring is provided.
   c. Manual boxes are provided in locations supervised by staff.

5. Manual fire alarm boxes shall not be required in Group E occupancies where the building is equipped throughout with an approved automatic sprinkler system. Notification appliances shall activate on sprinkler water flow and a manual pull station shall be provided in locations supervised by staff (e.g., teachers' lounge, custodial office, boiler room, auditorium, or cafeteria).

Add Section 907.2.5.1 as follows:

907.2.5.1 Emergency alarms. Where emergency alarms are required by IFC Section 908 and a fire alarm or sprinkler alarm system is provided, emergency alarm initiating devices and notification appliances shall be connected to the fire alarm or sprinkler alarm system and transmit an alarm signal to the monitoring station, where provided. The emergency alarm devices serving this area shall be distinctly annunciated as a separate zone at the building annunciator panel and provide a local alarm to notify occupants. Where emergency alarms are required and a fire alarm system is not provided, manual alarm initiating devices shall be installed in an approved location adjacent to each exit door from the area and local audible/visible appliances shall be provided to notify occupants in accordance with IFC Chapter 27.

Replace Section 907.2.6 as follows:

907.2.6 Group I. A manual fire alarm system shall be installed in Group I occupancies. Group I occupancies shall be provided with an emergency voice/alarm communication system per IFCA Section 907.2.12.2, where partial evacuation is provided.

Exceptions:

1. Manual fire alarm boxes in patient sleeping areas of Group I-1 and I-2 occupancies shall not be required at exits if located at all nurses' control stations or other constantly attended staff locations, provided such stations are visible and continuously accessible and that travel distances required in IFC Section 907.4.1 are not exceeded.
2. Visible alarm-signaling devices are allowed to substitute for audible devices in patient use areas.
3. A pre-signal system may be installed if approved by the Fire Department. Twenty-four hour personnel supervision is required at approved locations. Chimes may be installed in lieu of audible notification appliances. A Denver Fire Department permit is required for pre-signal or alarm verification equipment.
4. Automatic fire detectors are not required in sprinklered areas less than 24 sq. ft. (2.23sq m).

Replace Section 907.2.6.1 as follows:

907.2.6.1 Group I-1. Corridors, habitable spaces, sleeping rooms, and waiting areas that are open to corridors shall be equipped with an automatic smoke detection system. Smoke detectors shall be located on the ceiling or wall outside of each separate sleeping area in the vicinity of bedrooms, and in each room used for sleeping purposes.

Amend Section 907.2.6.2 by adding the following:

Patient room smoke detectors. Automatic detection shall be provided in patient rooms. Actuation of patient room system smoke-detectors shall cause a visible display on the corridor side of the rooms in which the detector is located and shall cause an audible and visible alarm at the respective nurse's station. Actuation of patient room smoke detectors shall not activate the building visible and audible fire alarm appliances.

Delete 907.6.2 Exceptions 1 and 2.

Add Sections 907.2.6.3.4 and 907.2.6.3.5 as follows:

907.2.6.3.4 Zoning and annunciation. Alarm, supervisory and trouble signals shall be annunciated at the annunciation panel and be transmitted to the central station. Alarm signals shall indicate the type of alarm and the zone of origin, in accordance with NFPA 72. Separate zones shall be provided for individual fire protection systems, buildings, building levels, cell complexes and sections of floors constructed as smoke compartments**.**

907.2.6.3.5 Monitoring. The fire alarm system shall be monitored by an approved central station service or by transmission of a local alarm which will give audible and visible signals at an approved constantly attended location.

Replace 907.2.8.2 as follows:

907.2.8.2 Automatic fire alarm system. An automatic fire alarm system shall be provided in all common areas and interior corridors.

Exception to remain.

Replace Section 907.2.8.3 as follows:

907.2.8.3 Smoke alarms. Smoke alarms shall be provided as required in IFC Section 907.2.10. Such devices shall not be connected to the fire alarm system unless for supervision only.

Add Section 907.2.8.4 as follows:

907.2.8.4 Visible notification appliances. Group R-1 sleeping units shall be provided with visible notification activated by an integral in-room smoke alarm. Visible notification appliances shall also be provided which are activated by the building fire alarm and/or automatic sprinkler system. The minimum number of sleeping units to be provided with visible notification appliances shall be in accordance with IFC Table 907.10.1.3.

Add Section 907.2.9.1 as follows:

907.2.9.1 Visible notification appliances. Where a fire alarm and/or automatic sprinkler system is installed in R2 occupancies, visible notification appliances shall be provided within type " A" dwelling units and/or sleeping units as follows:

1. Single and multiple-station smoke alarms (120 Vac) shall have integrated visible notification appliances for occupant notification within each dwelling unit or sleeping unit.
2. Visible notification appliances activated by the building fire alarm system shall be provided in dwelling units and sleeping units. These visible notification appliances shall be located in the living rooms, sleeping rooms, kitchens and toilet rooms to provide coverage as required by NFPA 72.

Amend Section 907.2.10.1.2 by deleting references to "I-1" in the first and third lines.

Add Section 907.2.10.1.2.1 as follows:

907.2.10.1.2.1 Visible notification appliances in R3 and R4 occupancies. Sleeping rooms shall be provided with visible notification activated by an integral in-room smoke alarm. Visible notification appliances shall also be provided which shall be activated by the building fire alarm and/or sprinkler system, where provided.

Amend Section 907.2.10.1.3 by changing "single- or multiple-station smoke alarms" to "system smoke detectors with listed audible notification capability." Exception is deleted.

Delete Section 907.2.10.2 Exception.

Amend Section 907.2.12 by inserting, "and manual" after the word "automatic" in the 4th line.

Replace 907.2.12.1 as follows:

907.2.12.1 Automatic fire detection. Smoke detectors shall be provided in accordance with this section. Smoke detectors shall be connected to an automatic fire alarm system. The activation of any detector required by this section shall operate the emergency voice/alarm communication system and shall place into operation all equipment necessary to prevent the re-circulation of smoke in accordance with IFC Section 909. Smoke detectors shall be located as follows:

1. In each mechanical equipment, electrical, transformer, telephone equipment or similar room, elevator machine rooms and in all elevator lobbies.
2. In the main return air and exhaust air plenum of each air-handling system having a capacity greater than 2,000cfm ($0.9m^3/s$) in accordance with International Mechanical Code (IMC) Section 606.2.1. Where multiple air-handling systems share common supply or return air ducts or plenums with a combined capacity greater than 2,000cfm (0.9cu m/s), smoke detectors shall be provided in accordance with IMC Section 606.2.2. Such detectors shall be located in a serviceable area downstream of the last duct inlet. Duct type smoke detectors shall cause a supervisory signal, not an alarm signal, at the building annunciator panel. Detectors shall be listed for the air velocity in which they are installed.

Exception: .

Smoke detectors are not required for automatic shut-off of evaporative coolers or units that supply un-tempered 100% outside air.

3. In the outlet of fans used for pressurization of stairways, hoistways and refuge areas. Activation of these smoke detectors shall cause a supervisory signal, not an alarm signal at the building annunciator panel. Detectors shall be listed for the air velocity in which they are installed.
4. At each connection to a vertical duct or riser serving two or more stories from a return air duct or plenum on an air-handling system. In Group R-1 and R-2 occupancies a listed smoke detector is allowed to be used in each return air riser carrying not more than 5,000 cfm ($2.4m^3/s$) and serving not more than 10 air inlet openings. These detectors are not required at return openings located in a corridor that is protected by full corridor or full floor area detection.
5.. In all interior corridors serving as a means of egress for Group R-1, R-2 and R-4 occupancies, with an occupant load of 10 or more.
6.. Not less than one foot but no more than three feet on the occupied side of each door that enters an area of evacuation assistance, elevator lobby and exit stairway which does not directly exit from an area of evacuation assistance, for occupancies other than R-1, R-2 and R-4.
7. At unenclosed openings, where shaft enclosures are not required in accordance with Exception 2, 7 or 11 to Section 707.2 of the IBC or IBCA. Detectors shall be located at the perimeter of the opening, on each level, not less than 4ft. (1.219m) and not more than 8ft. (2.4384m) from the edge of the opening. Detectors at the highest level shall be installed to provide coverage 30ft. (9.144m) beyond the perimeter of the projected opening. (For atriums as defined by this code, see IFCA Section 907.2.13.)
8. At vertical openings for non-required stairwells/escalators in Group B and M occupancies. Smoke detectors shall be installed adjacent to the floor side of each opening where the area of the floor opening between stories does not exceed twice the horizontal projected area of the escalator or stairway and a smoke management system is provided in accordance with IFC Section 909.
9. At the top of stairwells and in elevator hoistways. These devices shall initiate an alarm condition and illuminate the respective indicator at the graphic annunciator. They shall not initiate occupant notification or the smoke control sequence.

907.2.12.1.1 Large assembly areas (occupant load of 1000 or more). Smoke detection shall be provided as follows:

1. Electrical equipment rooms.
2. Detector zones may not exceed 22,500 sq. ft (2090.318sq m) and no detector zone shall serve more than one smoke control zone.

Where ceiling heights are 25 ft (7.62m) or greater, air sampling-type smoke detection systems or approved beam detection shall be provided in lieu of ceiling spot smoke detection.

Replace 907.2.12.2 as follows:

907.2.12.2 Emergency voice/alarm communication system. Emergency voice/alarm communications systems shall be connected to a UL 864 listed fire alarm system and located in an area constructed in accordance with the International Building Code as amended. Components shall be listed under UL product category code designation UOXX or UUMW. The operation of any manual fire alarm box, automatic fire detector or water flow device shall automatically sound an alert tone followed by voice instructions giving approved information and directions for a general or staged evacuation to the following areas as a minimum:

1. Elevators (selective activation from the fire command center only)
2. The fire floor; the floors immediately above and below the fire floor; and the level where the fire command center is located.
3. Exit stairways (selective activation from the fire command center only),
4. Each assembly room of 1,000 occupants or more.

5. Areas of refuge as defined in IFC Section 1002.1.

Exceptions:

1. In Group I-1 and I-2 occupancies, the alarm shall sound in a constantly attended area and a general occupant notification shall be broadcast over the overhead page.
2. In special amusement buildings only general notification is required.

907.2.12.2.1 Manual override. A manual override for emergency voice communication shall be provided on a selective and all-call basis for all paging zones.

907.2.12.2.2 Live voice messages. The emergency voice/alarm communication system shall also have the capability to broadcast live voice messages on a selective and all-call basis to all areas indicated in IFCA Section 907.2.12.2.

907.2.12.2.2.1 In very high noise areas, such as theaters, nightclubs, ballrooms and dance halls, the system shall be designed to reduce or eliminate the background noise upon alarm initiation.

907.2.12.2.3 Standard. The emergency voice/alarm communication system shall be designed and installed in accordance with IFCA Section 907.2.12.2 and NFPA 72.

907.2.12.2.4 System design. The emergency voice/alarm communication system shall be designed such that no more than ½ the speakers on a floor shall be affected by loss of any one amplifier, pre-amplifier or cable within the floor or communication zone. Class A wiring configuration is acceptable. Communication riser shall be installed in metallic conduit and shall comply with NFPA 70.

Replace Section 907.2.12.3 as follows:

907.2.12.3 Fire Department communications system. Two-way telephone communications service shall be connected to a UL 864 listed fire alarm system. Design of the Fire Department communications system shall consist of both of the following:

1. Hardwired components, in accordance with IFCA Section 907.2.12.3.2, consisting of plug-in phone jacks, permanent handsets, amplifiers and cable system for selective and "all-call' operation. Components shall be listed under UL product category code designation UOXX, and;
2. Radio communications using the "Department of Safety Radio Communications System" in accordance with IFCA Section 907.2.12.3.3 .

907.2.12.3.1 Operation. Both hardwired and radio communication systems shall operate between the FCC and the following locations:

1. Elevators and elevator lobbies
2. Emergency and standby power rooms
3. Standpipe hose connection locations

Exception:

Phone jacks are not required at standpipe outlet locations within stair enclosures.

4. The building engineer's office
5. Mechanical rooms
6. Elevator equipment rooms
7. Fire pump rooms
8. Areas of refuge
9. Entries into required exit stairways
10. Rooms containing the primary means to disconnect electrical service

907.2.12.3.2 Hardwired systems. An approved two-way, Fire Department communication system shall be provided for Fire Department use. Each circuit on the two-way Fire Department communication system shall have a separate control switch on the fire alarm control panel. The vertical riser shall be installed in

accordance with the National Electrical Code and shall be run in a minimum two-hour rated enclosure or listed two-hour cable.

907.2.12.3.2.1 Handsets. Both permanently mounted and mobile telephone handsets shall be provided.

907.2.12.3.2.1.1 Permanent handsets. Each permanently mounted handset shall initiate a signal from the handset to the FCC. Permanently mounted telephone handsets shall be provided in the locations listed below:

1. Building engineer's office
2. Each mechanical room with fans used for smoke control
3. Emergency and standby power rooms
4. Each fire pump room
5. Rooms containing the primary means to disconnect electrical service
6. Each elevator equipment room

907.2.12.3.2.1.2 Mobile handsets. A minimum of six mobile handsets shall be provided in an approved cabinet located in the FCC. When a mobile handset is plugged into any Fire Department communication system jack, the jack shall eliminate feedback by disconnecting any voice communication speaker system in the immediate area. Wiring supervision to the disconnected speaker(s) is not required to be maintained during handset use.

907.2.12.3.3 Radio systems. New high-rise buildings shall be equipped throughout with an approved Department of Safety Radio Enhancement System (RES) for radio communications in accordance with this section. The RES shall use bi-directional amplifiers with radiating ("leaky coax") cable, or a discrete distributed antenna system or an equivalent technology. Radio communications systems shall operate on the frequencies range of 800 MHz to 870 MHz. Amplifiers shall be powered by a dedicated uninterruptible power source (UPS) with a minimum backup time of eight (8) hours with all amplifiers at rated output. The UPS input circuit shall be a dedicated circuit and connected to the emergency generator, where provided. The circuit shall be provided with a "lock-on" device.

907.2.12.3.3.1 Definitions.

Coverage Requirement. The radio system control channel signal level shall exceed -100dBm at 90% or more of the locations measured within each grid area. Equivalently, the service area reliability shall be 90% or greater on each floor of the structure and parking areas.

Radio Frequency Maintenance Plan. The Radio Frequency Maintenance Plan is a document developed by the Fire Department and distributed by the building owner for the purpose of maintaining the Department of Safety radio system from harmful interference generated on the property or otherwise under the control of the owner. At a minimum, it shall:

- Prohibit the use of any electronic systems known to degrade the effectiveness of Department of Safety radio communications.
- Permit Department site access during reasonable business hours when necessary to assess the source of interference to Department of Safety radio communications.

Department of Safety Radio Enhancement System (RES). The RES is a network of amplifiers, fiber optic cable, coaxial cable, and radiating cable and/or discrete antennas or an equivalent technology installed on or inside the property to enhance indoor radio communications.

907.2.12.3.3.2 Requirements. The system shall effectively operate throughout the structure. In addition to the areas identified in IFCA Section 907.2.12.3.1, radio communication is required throughout the parking garage and all areas below grade. Those areas which shield radio communication will be remedied through the use of currently acceptable technology, i.e. bi-directional amplifiers or (leaky coax) amplifier systems. Acceptance of the completed communication system will be based upon Fire Department approval of the acceptance test as described below.

1. **Acceptance Test.** Measurement locations shall be uniformly distributed to the extent practical. There shall be at least 10 sampling measurements per 2,250 sq ft. (209.025 sq m) of gross building square footage. Adequate radio coverage shall be determined for the structure and parking areas separately. Elevators, stairways, and enclosed areas within each grid must be included in the testing. Execute the following steps:

   a. Create a uniform grid over each floor with 15 ft. (4.57 m) centers.

   b. At each accessible grid location, using a test receiver with sensitivity and thermal noise floor equal to or better than the Department of Safety radio, take at least one sample measurement of the radio system control channel.

   c. Repeat Step b for each grid point.

   d. Calculate the service area reliability:

$$\text{Service Area Reliability (\%)} = \frac{{}^{T}p}{T_t} 100\%$$

   Where ${}^{T}p$ is the total number of grid points passed (i.e., control channel > -100dBm) T_t is the total number of grid points measured.

   If the building fails to achieve the coverage requirement, the building owner shall install additional RES and conduct a new acceptance test.

   Measurements shall be taken with calibrated radio receivers by Denver Fire Department radio technicians or technicians with appropriate knowledge and training who are licensed by the Denver Fire Department to install RES systems, at the City's option. Test results shall be certified by a professional engineer licensed by the state of Colorado or by Denver Fire Department radio technicians. Random spot testing by Denver Fire and/or Police officials may take place at any time.

2. **Radio Frequency Maintenance Plan.** A radio frequency maintenance plan shall be developed which prohibits use of electrical/electronic equipment which cause degradation to the RES. The radio frequency maintenance plan shall be incorporated into the lease of every tenant.

3. **Periodic Testing of RES.** Periodic testing of the RES shall be conducted as follows:

   If the radio enhancement system appears to have degraded or if the tests fail to demonstrate adequate system performance in compliance with this standard, the owner of the building or structure is required to restore the system to a condition consistent with the original approval criteria. If the degradation to the system is due to building additions or renovation, the owner of the building shall restore/extend the system to all areas of the building in a condition consistent with the original approval criteria. Random spot testing by Denver Fire and/or Police officials may take place at any time.

   a. Annual testing. All active components of the system, such as amplifiers, power supplies and backup batteries, shall be tested annually. Alternatively, the RES may be continuously monitored electronically with remote fault alarms. Amplifiers shall be tested or monitored to ensure that the gain has not degraded from the installed value. Backup batteries and power supplies shall be tested under load for a period of at least one hour to verify that they will properly operate during an actual power outage. Annual tests shall be performed in accordance with the acceptance test procedures described above and shall be conducted in all common areas, garages, stairwells, elevators and corridors. Measurements shall be taken with calibrated radio receivers by Denver Fire Department radio technicians or technicians with appropriate knowledge and training and licensed by the Denver Fire Department. Test results shall be certified by a professional engineer licensed by the state of Colorado or by Denver Fire Department radio technicians.

   b. Five-year testing. Every five (5) years, a radio coverage test in accordance with the Acceptance Test procedure described above shall be performed to ensure the system provides adequate radio coverage. Documentation of test results shall be submitted to the Fire Department.

4. **Failure detection.** RES equipment shall have failure detection circuitry which provides detection of mechanical, electrical and power failure of the RES, as well as oscillation detection capability which

will reduce the amplifier output to zero in the event of system oscillation. Detection of any failure shall result in a distinct audible notification at a constantly attended location approved by the Fire Department.

5. **Permits.** A #3A permit is required prior to installation. Repair, alteration or replacement of any RES system or component shall require issuance of a #3A permit. Submittal and approval of shop drawings are required to obtain a permit for RES system installations. Permits shall only be issued to companies possessing a valid Fire Department issued certificate.

6. **Information signs.** A legible sign stating "THIS BUILDING IS EQUIPPED WITH A RADIO REPEATER SYSTEM" shall be conspicuously posted in the fire command center.

Add Section 907.2.12.4 as follows:

907.2.12.4 Smoke control system activation. Smoke control systems shall be automatically activated by automatic detection devices, water flow, manual pull station and manual operation from the fire command center (FCC). After the initial alarm activation, any subsequent automatic alarm activation on another floor shall initiate the floor exhaust sequence per IFCA Section 907.2.12.4.2. Activation by any alarm initiating device shall be as described herein.

Exception:

Main sprinkler system water flow, heat or smoke detectors located in stairwells or hoistways and sprinkler system waterflow in building service chutes or elevator hoistways. Where building shafts are protected with automatic sprinklers for reduction in shaft construction fire rating, a separate riser shall be provided.

907.2.12.4.1 Activation of pressurization. Activation of stairway and elevator hoistway pressurization shall be automatic by:

1. Activation of any smoke or heat detector or water flow device.
2. Activation of any manual fire alarm box.

907.2.12.4.2 Smoke control exhaust. Exhaust in a smoke control zone shall be automatically activated by any automatic fire alarm initiating device within the respective smoke control zone.

Exception:

Where floors are open to each other as permitted by IBC or IBC as amended, each floor shall be considered a separate smoke control zone.

907.2.12.4.3 Operation. Upon activation of any initiating device as described in IFCA Section 907.2.12.4.2, the following sequence shall occur:

1. Open exhaust dampers on the floor in alarm.
2. Start exhaust fans.
3. Close exhaust dampers to all other floors.
4. Turn off all supply and make-up air fans.
5. Close all floor supply air dampers.
6. Start stair and hoistway pressurization fans.

907.2.12.4.4 Large assembly areas (occupant load of 1000 or more). Where required by IFC Section 909.21.7.1, the smoke control system shall be activated automatically by any alarm initiated from a smoke detector, heat detector, sprinkler waterflow alarm or air sampling-type smoke detector. Operation shall comply with the following:

1. Open exhaust dampers for zone in alarm
2. Start zone exhaust fan
3. Close supply dampers to zone in alarm
4. Start stair and hoistway pressurization fans

5. Adjacent zones go to 100% outside air
6. All other systems maintain normal operation.

Add Section 907.2.12. 5 as follows:

907.2.12.5 Annunciation. Point-lit graphic annunciation shall be provided in accordance with IFCA Section 907.9.1.2.

Add Section 907.2.12.6 as follows:

907.2.12.6 Elevator recall and shunt trip. All elevators shall be provided with Phase I and Phase II emergency recall per IFC Section 607. System smoke detectors shall be located in elevator lobbies, hoistways and machine rooms. Activation of these smoke detectors shall return to grade level, nonstop, all elevators serving that alarm zone, except for the smoke detector in the elevator lobby at grade level which shall return the elevators to an alternate level. Elevators without a landing at grade level shall be returned to the landing that is closest to grade level or other approved level. The alternate level shall be approved by the fire code official. Elevators shall remain at the level where they returned in accordance with Amended IBC Section 3003**,** until being manually overridden by the operator key switch required by ASME A17.1 or the elevator control panel in the FCC. Elevator power shunt trip shall be provided for elevator shut down prior to sprinkler operation in accordance with NFPA 72.

907.2.12.6.1 Elevator status/Control panel. An elevator status/control panel shall be provided. The elevator status/control panel shall:

1. Identify each elevator cab numerically and the floors it serves. Identify corresponding cab number in elevator cab at permanent handset;
2. Indicate which elevator(s) are on emergency power;
3. Have a placard at elevator status/control panel stating how many elevators can operate under emergency power simultaneously;
4. Indicate elevator car position; and
5. Have key switches as required for selective activation of cars, if all are not provided with emergency power for simultaneous operation.

Add Section 907.2.12.7 as follows:

907.2.12.7 Emergency generator panel. An emergency generator panel shall be provided. The emergency generator panel shall show:

1. Operating status (on-off) and malfunction indication panel as required by NFPA 110
2. Indication of transfer switch position (normal-emergency)
3. Indication that generator is in automatic mode
4. Main fuel oil storage tank low fuel level alarm.

Add Section 907.2.12.8 as follows:

907.2.12.8 Fire pump panel. A fire pump panel shall be provided. The fire pump panel shall have:

1. Remote operating status indication panel as required by NFPA 20.
2. Motor/engine running/on or off. Pump running indication shall be transmitted to the fire alarm control panel as a supervisory signal and distinctly annunciated.
3. Low fuel level alarm for fire pump fuel tank.
4. If pumping is required from a main fuel tank to a diesel engine a duplex pumping system shall be provided. Emergency fuel flow controls are required in the FCC.

Replace Section 907.2.13 as follows:

907.2.13 Atriums connecting more than two stories. A fire detection and smoke exhaust system shall be installed in accordance with IFCA Sections 907.2.13.1 and 907.2.13.2 in occupancies with an atrium that connects more than two stories. The system shall be activated in accordance with this section.

907.2.13.1 Activation. Activation of two smoke detectors in the atrium shall initiate the atrium exhaust sequence below. In high-rise buildings, activation of a smoke detector located in areas separated from the atrium by a smoke barrier shall operate in accordance with IFCA Section 907.2.12.4.

907.2.13.1.1 Operation. Upon activation of initiating devices, the following sequence shall occur:

1. Open atrium exhaust dampers.
2. Start exhaust fans.
3. Close exhaust dampers on all floors.
4. Start stair and hoistway pressurization fans, where provided.
5. Open supply dampers to atrium.

907.2.13.1.2 Detection. Detection shall be as follows:

1. Area type smoke detectors, spaced in accordance with NFPA 72, shall be installed at the atrium ceiling where the ceiling is 30 feet (9.144m) or less from the floor of the atrium. If the ceiling is greater than 30 feet (9.144m) from the atrium floor, beam type detectors shall be installed. A detection system with alarm verification may be installed. The initial device in alarm shall initiate a supervisory condition at the fire alarm panel.
2. On the underside of projections into the atrium, spaced in accordance with NFPA 72.
3. Around the perimeter of the atrium opening on all floors open to the atrium. The detectors shall be spaced not more than 30 feet (9.144 m) on center and shall be located within 15 feet (4.572 m) of the atrium opening.
4. In high-rise buildings, where any part of the floor is open to an atrium, smoke detectors shall be located throughout the floor not included in the atrium area for every 2500 sq. ft. (232.258 sq m) of occupied floor space. No smoke detector shall serve more than one smoke zone.
5. All smoke detectors shall be accessible for maintenance and testing.

Delete Section 907.2.14.

Amend Section 907.2.15 by adding the following to the end of the last sentence:

"….and in compliance with International Building Code Amendments Appendix L."

Amend Section 907.2.18.2 by adding the following to the end of the last sentence:

"…where provided, or a local alarm to notify occupants.

Add Section 907.2.18.3 as follows:

907.2.18.3 Annunciation. Point-lit graphic annunciation shall be provided per IFCA Section 907.9.1.2.

Add Section 907.2.18.4 as follows:

907.2.18.4 Fire department communications system. A radio communication system complying with IFCA Section 907.2.12.3.2 shall be provided.

Add Section 907.2.19.2 as follows:

907.2.19.2 Annunciation. Point-lit graphic annunciation shall be provided per IFCA Section 907.9.1.2.

Add Section 907.2.19.3 as follows:

907.2.19.3 Fire Department communications system. A radio communications system complying with IFCA Section 907.2.12.3.2 shall be provided.

Add Section 907.2.20. 1 as follows:

907.2.20.1 Annunciation. Point-lit graphic annunciation shall be provided per IFCA Section 907.9.1.2. Alternatively, a "backlit" zone type annunciator may be provided where specifically approved by the Fire Department.

Add Sections 907.2.20.2 and 907.2.20.3 as follows:

907.2.20.2 Smoke detection in covered malls. For covered malls having a smoke control system per IFCA Section 909, smoke detection shall be provided as follows:

907.2.20.2.1 Tenant space and anchor stores:

1. On the tenant side at each opening into the mall and at each exit from the tenant space. For openings larger than 30 lineal feet 9.144m), an additional detector shall be provided for each 30 lineal feet (9.144m) or fraction thereof.
2. Electrical equipment rooms.
3. Detector zones may not exceed 22,500 square feet (2090.318 sq m) and no detector zone shall serve more than one smoke control zone.
4. Detectors in individual tenant spaces shall be spaced not to exceed 2,500 sq. ft. (232.258 sq m) per detector.

907.2.20.2.2 Covered mall area: A smoke detector shall be located in the supply system serving the covered mall area, after the filters, which will stop the supply fan and provide a supervisory signal. In addition, a smoke detector shall be provided in the return or exhaust air stream over 2,000 cfm (.94cu m/s).

907.2.20.3 Smoke control activation. The smoke control system for covered malls shall be activated by any alarm initiated from the smoke detection or sprinkler system, inclusive, in accordance with the sequence below. All smoke control equipment for both tenant space and the covered mall building shall be in place and operational before any portion of the covered mall building is occupied. The level of protection of the fire detection system for unoccupied tenant space shall be subject to the approval of the Fire Department.

1. Open zone exhaust dampers.
2. Start zone exhaust fans.
3. Close supply dampers to zone in alarm
4. Immediately adjacent zones go to 100% outside air.
5. All other systems remain in normal operation.

Replace Section 907.2.23 as follows:

907.2.23 Battery rooms. An approved automatic smoke detection system shall be installed in areas containing stationary storage battery systems having a liquid capacity of more than 50 gallons (189L). The detection system shall be supervised by an approved central, proprietary, or remote station service or a local alarm which will sound an audible signal at an approved location on the premises outside the battery room. Where a local alarm is installed, provide signage indicating; "BATTERY ROOM ALARM – CALL 911". In buildings with a monitored sprinkler or fire alarm/detection system, the battery room detectors shall be connected to the building fire alarm control panel.

Exception:

A dedicated, detached on grade structure not to exceed 1000 square feet.

Add Section 907.2.24 as follows:

907.2.24 Passenger terminal and concourse buildings. See IBCA Appendix N.

Delete Exceptions 1 and 2 to Section 907.3.1.1.

Amend Section 907.3.2 by adding the following after the last sentence:

Smoke alarms should be replaced 10 years from date of manufacture, in accordance with NFPA 72 Section 10.4.7.

Replace Section 907.4.4 as follows:

907.4.4 Signs. Where fire alarm systems are not monitored by a supervising station, an approved permanent sign that reads: LOCAL ALARM ONLY, PULL AND CALL 911 shall be installed adjacent to each manual fire alarm box. Where additional digits are required to access the public telephone system, signage shall reflect the additional digits required.

Exception:

Where the manufacturer has permanently provided this information on the manual fire alarm box.

Replace Section 907.6 as follows:

907.6 Wiring. Fire alarm system and communications wiring shall comply with provisions of NFPA 72 and NFPA 70 (NEC) Article 760, requirements for fire alarm and communications systems. Wiring color code shall be consistent throughout the entire system and permanently posted inside the fire alarm control panel. Separate colors shall be used for each type of initiating circuit, indicating circuit and control circuit. Color-coding shall be by continuous colored insulation or by application of 6-inch (15.24cm) long colored heat-shrink tubing at the end of each conductor at all splices, taps and terminations. Wireless protection systems utilizing radio-frequency transmitting devices shall comply with the special requirements for supervision of low-power wireless systems in NFPA 72.

Amend Section 907.7 by adding the following exceptions:

Exceptions:

1. Smoke alarms in dwelling units and rooms used for sleeping purposes in hotel and lodging houses. Duct detectors shall initiate a supervisory signal only. See IFCA Section 907.12.
2. Occupant notification is not required upon activation of detectors at the top of stairwells and in elevator hoistways.

Replace Section 907.9 as follows:

907.9 Zones. All fire alarm systems shall be divided into alarm zones. When two or more alarm zones are provided, visible annunciation shall be provided at an approved location. Zones shall comply with this section unless otherwise approved by the Fire Department. Trouble and supervisory signals shall be annunciated in accordance with this section and NFPA 72. Annunciator panels shall comply with IFCA Section 907.9.1. Annunciation zones shall comply with the following.

Each building level shall be annunciated separately as follows:

1. All manual devices.
2. All automatic devices. No single zone shall exceed 22,500 sq ft (2090.318sq m). No detection zone shall exceed 300 ft (91.44m) in length in any direction.
3. Each fire sprinkler water flow detection device. Sprinkler zones shall comply with NFPA 13.

Separate visible indication shall be provided for:

1. Main fire sprinkler flow. Individual risers per 903.
2. Each special extinguishing system.
3. Each non-required system.
4. Each special detection system.
5. Each stairway (where detection is provided).
6. Each elevator hoistway and machine room
7. System trouble.
8. Sprinkler control valves (supervisory only). Maximum 20 devices per zone.
9. Duct detectors (supervisory only). Maximum 20 devices per zone.
10. Fire pump running (supervisory only)

Replace Section 907.9.1 as follows:

907.9.1 Annunciator panels. Annunciator panels shall be point-lit graphic or a directory **LED** point display type. Upon initiation of an alarm, supervisory or trouble condition the panel shall record the status and "lock-in" until the fire alarm system is reset with a dedicated reset switch located at the main fire alarm control panel. Annunciation lights shall be red for "Alarm" and yellow for "Trouble" and "Supervisory" signals. Each signal type shall be distinctly identified.

907.9.1.1 Directory annunciator. A directory annunciator shall be provided as required. Location shall be field approved. The annunciator shall be provided with individual alarm and trouble indications per IFCA Section 907.9 for each zone. Indicators shall be of sufficient size and intensity to be visible in normal lighting.

Building plans shall be permanently mounted adjacent to directory type annunciator panels. Plans shall be of durable construction, easily readable in normal lighting, have a smooth plastic surface and shall clearly indicate the building outline and boundary of each zone and have a "you are here" with North orientation arrow. The plans shall clearly show:

a) Building address

b) Each stairwell uniquely identified

c) Each elevator uniquely identified

d) Emergency and standby power equipment locations

e) Fuel storage locations

f) Fire pump location

g) Sprinkler valve locations

h) Standpipe outlet locations

i) Main electrical room

j) Each initiating device

k) Site plan with:

1. Adjacent streets
2. Local fire hydrants
3. Utility shut-off equipment
4. Fire department connection

l) Other features required by the fire code official.

907.9.1.2 Point-lit graphic annunciator. A graphic annunciator shall be provided as required. Location shall be field approved. The annunciator shall consist of building plans per IFCA Section 907.9.1.1 with the addition of discrete indication for each alarm and supervisory initiating device. The annunciator shall be provided with a momentary push-button "Lamp Test." Separate indications for "Trouble" and "Supervisory" conditions shall be provided.

907.9.1.2.1 Where required. A point-lit graphic annunciator is required for the following; underground buildings, high-rise buildings, buildings with a smoke control system per IFC Section 909 and where required for a pre-action fire sprinkler or clean agent extinguishing system per IFCA Section 907.14.1.1.

Delete Section 907.9.2.

Replace Section 907.10 as follows:

907.10 Alarm notification appliances. Audible and visible alarm notification shall be provided to alert occupants of the area having a fire alarm system as well as in the means of egress serving the occupancy. The fire alarm control panel shall incorporate an alarm silencing switch that shall only de-activate the audible notification appliances until the system is manually reset. Alarms shall be provided per IFCA Sections 907.10.1 and 907.10.2, and as required by other sections of this code.

907.10.1 Visible alarms. Visible notification shall be provided in toilet rooms accessible to the disabled, in corridors, public and common areas and in areas of assembly. In residential occupancies visible notification shall be installed in toilet rooms, bedrooms and living rooms of units accessible to the disabled. Visible alarms shall be installed in accordance with NFPA 72.

Exceptions:

1. Visible alarm signals in patient and inmate areas of Group I occupancies may be provided per IFCA Section 907.2.6.
2. Visible notification appliances shall not be installed in stairwells.
3. In existing buildings with only audible alarms, visible alarms are not required to be added during the course of any tenant finish or fire alarm system modification work. If a building owner desires to install visible alarms, the number and location shall be at the owner's discretion. A separate circuit between the fire alarm control panel and the visible appliances is not required. This exception does not apply if the building is undergoing a change in use or visible alarms are required as part of the equivalent construction to correct an exiting deficiency.

Delete Section 907.10.1.1.

Delete Section 907.10.1.2.

Delete Section 907.10.1.3.

Retain Table 907.10.1.3.

Delete Section 907.10.1.4.

Amend Section 907.10.2 by adding the following after the last sentence:

In theaters, nightclubs, dance halls, ballrooms and similar areas, means shall be provided to reduce or eliminate background noise upon activation of the fire alarm system. The fire alarm system shall produce a sound level at least 15 dBA above the reduced average ambient sound level or 5 dBA above the maximum sound level having a duration of at least 60 seconds whichever is greater. The reduced sound level shall not require audible notification to exceed 115 dBA.

Replace Exception to Section 907.10.2 as follows:

Exception:

This audible notification is not required for systems using prerecorded or live voice message announcement.

Amend Section 907.12 by adding the following after the last sentence:

Spot-type smoke detectors may be used for return air system connection to vertical risers serving two or more stories per NFPA 72. Detectors shall be listed for the maximum anticipated airflow velocity. Detectors concealed above the ceiling shall be provided with a remote indicating light mounted on the ceiling directly below the device, in accordance with IFCA Section 907.23.

Delete Exception 1 to Section 907.12.

Add Section 907.14.1 as follows:

907.14.1 Pre-action and clean agent extinguishing systems. Pre-action and clean agent extinguishing systems shall have a dedicated releasing panel and annunciator connected to the building fire alarm system where provided. Pre-action systems shall be installed per NFPA 13. Clean agent systems shall comply with IFC Section 904.10. Control panels shall be listed for releasing service. Control panel and annunciator shall be located outside the protected area in a location approved by the Fire Code official. Areas protected by a single system shall be contiguous. Shop drawings for system installations shall be submitted per IFCA Section 907.1.1, NFPA 13 and NFPA 2001. Cross-zoned detection systems shall transmit a building alarm on activation of the first initiating device. Fire protection piping and initiating device, control and annunciation drawings shall be submitted together. Clean agent systems are supplemental and not permitted to substitute for required automatic sprinkler systems unless specifically approved by the Chief.

907.14.1.1 Annunciation. Pre-action and clean agent systems shall be provided with a local directory annunciator zoned for manual, smoke detector, flow alarm and tamper supervisory indications. Systems with under floor and/or above ceiling detection devices shall be provided with a point-lit graphic annunciator in accordance with IFCA Section 907.9.1.2. Systems shall annunciate alarm and supervisory conditions at the main building fire alarm panel.

Add Section 907.21 as follows:

907.21 Monitoring Integrity. Conductors and connections that interconnect equipment, devices and appliances shall be monitored for integrity, as set forth in NFPA 72.

Add Section 907.22 as follows*:*

907.22 Survivability. Where occupant relocation or partial evacuation is part of the building life-safety plan, fire alarm system survivability shall be provided in accordance with NFPA 72. Audible and visible notification appliance circuits shall be designed and installed such that attack by fire within an evacuation zone shall not impair control and operation of the notification appliances outside the evacuation signaling zone.

Exception:

Notification appliance circuits shall not be run in stairwells, except for the specific devices located in the stair enclosure.

Add Section 907.23 as follows:

907.23 Remote indicating lights. A remote indicating light shall be installed for detector(s) within each room with an entry door. The indicating light shall be located on the wall or ceiling above the door and within 12 inches (30.48cm), on the exit corridor side. This shall include each door leading through adjoining or intervening rooms from an exit corridor to that room (progressive type). Remote indicating lights shall be installed on the ceiling directly below detectors located above ceilings. Remote indicating lights for duct detectors shall be installed in an accessible area directly below or adjacent to the detector. Remote indicating lights shall remain lit until the fire alarm system is reset.

Exception:

Remote indicating lights may be deleted where a point-lit graphic annunciator is provided.

Add Section 907.24 as follows:

907.24 Elevator recall and shutdown. Elevator recall and shunt trip shall be provided for all elevators in accordance with IFC Section 607. Fixed temperature 190 degree F heat and smoke detectors shall be located in accordance with NFPA 72. Where environmental or other conditions prohibit installation of smoke detectors for recall, 135 degree F fixed temperature heat detectors shall be permitted to substitute for the required recall smoke detectors. In buildings with a fire alarm system, these detectors shall be connected to the building fire alarm system. In buildings without a fire alarm system, system smoke detectors and a dedicated fire alarm system control unit shall be provided that is designated as an "elevator recall control and supervisory panel." The system shall be designed and installed in accordance with NFPA 72 and ASME A17.1. Where required, elevator power shunt trip shall be provided prior to sprinkler operation in accordance with NFPA 72. Where MRL elevator equipment is installed, smoke and heat detectors shall be provided at the top of the hoistway. Recall smoke detectors shall be installed in the control equipment space. Shunt trip heat detectors shall be installed in the control equipment space if it is protected by sprinklers. Shunt trip circuit breakers shall be located in either the main power distribution room or installed in the elevator machinery room/space in a NEMA 3R enclosure.

Exception:

For existing buildings, an administrative modification shall be submitted for approval where an existing complying fire alarm control unit cannot be expanded within its listing to accommodate the additional devices for recall and shunt trip. Upon approval, a dedicated "elevator recall and supervisory panel" shall be installed in accordance with the provisions for buildings without a fire alarm system. The administrative modification shall state the practical difficulties involved in incorporating the recall/shunt trip devices into the existing fire alarm system.

907.24.1 Hoistway vent operation. All hoistway vents shall be electrically closed motorized vents and shall open automatically by any one of the following:

1. `The elevator hoistway smoke detector
2. `Elevator lobby smoke detector
3. `Power failure to the vent

On activation of the hoistway vent or elevator lobby smoke detector, the elevator(s) shall be placed in the fire recall mode. The hoistway vent and elevator lobby smoke detectors shall be connected to the control unit as required by Section 907.24 above. A manual override shall be provided by a keyed switch located adjacent to the fire alarm control panel. The switch shall be labeled "hoistway vent" and shall indicate an open and closed

position. The hoistway vents shall return to the closed position by resetting the fire alarm control panel and placing the "hoistway vent" switch in the closed position.

Add Section 907.25 as follows:

907.25 Non-required full or partial systems. Fire alarm systems and fire detection systems not required in this Code or by special agreement are not required to be connected to a central station. Where non-required fire alarm and/or fire detection systems are connected to a central station, the central station shall be an approved Class I central station. Multiple central station connections from one building are not permitted. Non-required full or partial fire alarm or fire detection systems are required to comply with NFPA 72. Annunciation shall be provided in accordance with IFCA Section 907.9. Annunciator and control panels for non-required or partial systems shall be of an approved type and have permanent signage indicating "Non-required System" or "Partial System." Partial fire alarm and/or fire detection systems installed in a building having a required fire alarm system shall be annunciated separately on the building fire alarm annunciator panel.

907.25.1 General system design and installation requirements. Shop drawings must be submitted for approval. Documents shall be stamped and signed by a Colorado registered engineer and shall comply with IFCA Section 907.1.1. Non-required systems installed in a building with a required fire alarm system shall have the non-required system connected to the required fire alarm control panel. Each non-required system shall annunciate as a separate zone at the required fire alarm control panel. Multiple fire alarm control panels are not allowed where a required system is installed.

Replace Section 909 as follows:

SECTION 909
SMOKE CONTROL SYSTEMS

909.1 Scope and purpose. This section applies to mechanical or passive smoke control systems when they are required by other provisions of this code. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations or for assistance in fire suppression or overhaul activities. Smoke control systems regulated by this section serve a different purpose than the smoke- and heat-venting provisions found in Section 910. Mechanical smoke control systems shall not be considered exhaust systems under Chapter 5 of the *International Mechanical Code*.

909.2 General design requirements. Buildings, structures or parts thereof required by this code to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 909 and the generally accepted and well-established principles of engineering relevant to the design. The construction documents shall include sufficient information and detail to adequately describe the elements of the design necessary for the proper implementation of the smoke control systems. These documents shall be accompanied by sufficient information and analysis to demonstrate compliance with these provisions.

909.2.1 Specific Requirements – Pressurization Systems. Stairway pressurization systems and hoistway pressurization systems shall be provided for all high-rise buildings. The inclusion of these systems may be used to offset specific requirements for other building components, as described in other Sections of the Code; however, the use of other building components may not be used to circumvent the requirement for including these systems.

Exception:

Where stairway enclosures directly open into open exterior balconies.

909.2.2 Specific Requirements – Smoke Exhaust Systems. A smoke exhaust system(s) shall be provided for all high-rise buildings. The smoke exhaust system(s) shall be configured and controlled to exhaust the fire floor or fire zone. This requirement shall be applicable to the Occupancy Groups as follows: A; B; E; M; R1; R2, and I1 and I3.

909.2.3 Specific Requirements – Construction Document Submittals. Construction documents for smoke control systems shall be submitted for permit application with the construction drawings for the project per IBCA Section 154 including the seal and signature of the design professional responsible for the coordination of the smoke control design package. Included within this submittal shall be the following.

1. Code reference used as a basis of design, including any administrative modifications or Board of Appeals decisions.
2. Plans identifying each smoke control zone including a listing of smoke control equipment (fans) associated with each respective zone. A combination of vertical (section), horizontal (plan) and/or schematic views may be necessary to clearly depict each zone.
3. Plans shall identify location of smoke control duct inlet/discharge locations and all fire/smoke damper locations.
4. Detailed description of the systems interface to the emergency power system and plans detailing locations of panels (with schedules) and associated circuits and disconnects.
5. Plans shall identify HVAC systems operating status (i.e. on/off) during a smoke control scenario, e.g., toilet exhaust, general HVAC, etc.
6. Written narrative sequence of operation for the complete smoke control system.
7. Basic fire alarm drawings shall be developed with sufficient detail to demonstrate system control/sequence.
8. Fans sizing calculations for each zone including stairways and hoistways.
9. Preliminary acceptance testing plan and procedure.

909.2.4 Specific Requirements – Shop Drawing Submittals (Deferred Submittal). The deferred submittal shall be consistent with the approved construction document submittal and reviewed by the engineer of record prior to submission to the Denver Fire Department. Included within this submittal shall be the following.

1. Code reference used as a basis of design, including any Administrative Modifications or Board of Appeals decisions.
2. Plans identifying each smoke control zone including a listing of smoke control equipment (fans) associated with each respective zone. A combination of vertical (section) and/or horizontal (plan) views may be necessary to clearly depict each zone.
3. Fire protection shop drawings.
4. Plans identifying control equipment including wiring diagrams and tubing schematics as applicable.
5. Manufacturers' specification sheets for all equipment and devices associated with the smoke control system including but not limited to the following: Fire alarm system, fans, dampers, louvers, door release hardware, automatic door opening harware, CT switches, end-switches, pressure sensors, control tubing, etc.
6. Detailed description of the required applicable UUKL criteria and plans/procedures for complying with the weekly self-test. Printed reports must be maintained on-site in the fire command center.
7. Final Acceptance testing plan indicating systems testing.. Refer to Section 909.18 Acceptance Testing.

909.3 Special inspection and test requirements. Refer to Section 909.18.

909.4 Analysis. A rational analysis supporting the types of smoke control systems to be employed, their methods of operation, the systems supporting them and the methods of construction to be utilized shall accompany the submitted construction documents and shall include, but not be limited to, the items indicated in Sections 909.4.1 through 909.4.6. Refer to Section 909.21 Alternative design approach.

909.4.1 Stack effect. The system shall be designed such that the maximum probable normal or reverse stack effect will not adversely interfere with the system's capabilities. In determining the maximum probable stack effect, altitude, elevation, weather history and interior temperatures shall be used.

909.4.2 Temperature effect of fire. Buoyancy and expansion caused by the design fire in accordance with Section 909.9 shall be analyzed. The system shall be designed such that these effects do not adversely interfere with the system's capabilities.

909.4.3 Wind effect. The design shall consider the adverse effects of wind. Such consideration shall be consistent with the wind-loading provisions of IBC Chapter 16.

909.4.4 HVAC systems. The design shall consider the effects of the heating, ventilating and air-conditioning (HVAC) systems on both smoke and fire transport. The analysis shall include all permutations of systems status. The design shall consider the effects of the fire on the HVAC systems.

909.4.5 Climate. The design shall consider the effects of low temperatures on systems, property and occupants. Air inlets and exhausts shall be located so as to prevent snow or ice blockage.

909.4.6 Duration of operation. All portions of active or passive smoke control systems shall be capable of continued operation after detection of the fire event for a period of not less than either 20 minutes or 1.5 times the calculated egress time, whichever is less.

909.5 Smoke barrier construction. Smoke barriers shall comply with Section 709, and shall be constructed and sealed to limit leakage areas exclusive of protected openings. The maximum allowable leakage area shall be the aggregate area calculated using the following leakage area ratios:

1. Walls: $A/A_w = 0.00100$
2. Exit enclosures: $A/A_w = 0.00035$
3. All other shafts: $A/A_w = 0.00150$
4. Floors and roofs: $A/A_F = 0.00050$

where:

A = Total leakage area, square feet (m^2).
A_F = Unit floor or roof area of barrier, square feet (m^2).
A_w = Unit wall area of barrier, square feet (m^2).

The leakage area ratios shown do not include openings due to doors, operable windows or similar gaps. These shall be included in calculating the total leakage area.

909.5.1 Leakage area. The total leakage area of the barrier is the product of the smoke barrier gross area multiplied by the allowable leakage area ratio, plus the area of other openings such as gaps and operable windows. Compliance shall be determined by achieving the minimum air pressure difference across the barrier with the system in the smoke control mode for mechanical smoke control systems. Passive smoke control systems tested using other approved means such as door fan testing shall be as approved by the fire code official.

909.5.2 Opening protection. Openings in smoke barriers shall be protected by automatic-closing devices actuated by the required controls for the mechanical smoke control system. Door openings shall be protected by fire door assemblies complying with Section 715.4.3.

Exceptions:

1. Passive smoke control systems with automatic-closing devices actuated by spot-type smoke detectors listed for releasing service installed in accordance with Section 907.11.
2. Fixed openings between smoke zones that are protected utilizing the airflow method.
3. In Group I-2, where such doors are installed across corridors, a pair of opposite-swinging doors without a center mullion shall be installed having vision panels with fire protection-rated glazing materials in fire protection-rated frames, the area of which shall not exceed that tested. The doors shall be close-fitting within operational tolerances and shall not have undercuts, louvers or grilles. The doors shall have head and jamb stops, astragals or rabbets at meeting edges and shall be automatic-closing by smoke detection in accordance with Section 715.4.7.3. Positive-latching devices are not required.
4. Group I-3.
5. Openings between smoke zones with clear ceiling heights of 14 feet (4267 mm) or greater and bank-down capacity of greater than 20 minutes as determined by the design fire size.

909.5.2.1 Ducts and air transfer openings. Ducts and air transfer openings are required to be protected with a minimum Class II, 250°F (121°C) smoke damper complying with Section 716. Section 716.5.3 exceptions 1.3 and 1.4 are not permitted for shaft enclosures.

909.6 Pressurization method. The primary mechanical means of controlling smoke shall be by pressure differences across smoke barriers. Maintenance of a tenable environment is not required in the smoke control zone of fire origin.

909.6.1 Minimum pressure difference. The minimum pressure difference across a smoke barrier shall be 0.05-inch water gage (0.0124 kPa) in fully sprinklered buildings. In buildings permitted to be other than fully sprinklered, the smoke control system shall be designed to achieve pressure differences at least two times the maximum calculated pressure difference produced by the design fire.

909.6.2 Maximum pressure difference. The maximum air pressure difference across a smoke barrier shall be determined by required door-opening or closing forces. The actual force required to open exit doors when the system is in the smoke control mode shall be in accordance with Section 1008.1.2. Opening and closing forces for other doors shall be determined by standard engineering methods for the resolution of forces and reactions. The calculated force to set a side-hinged, swinging door in motion shall be determined by:

$F=F_{dc}+K(WA\Delta P)/2(W-d)$ **(Equation 9-1)**

where:

A = Door area, square feet (m2).
d = Distance from door handle to latch edge of door, feet (m).
F = Total door opening force, pounds (N).
F_{dc} = Force required to overcome closing device, pounds (N).
K = Coefficient 5.2 (1.0).
W = Door width, feet (m).
ΔP = Design pressure difference, inches of water (Pa).

909.7 Airflow design method. When approved by the fire code official, smoke migration through openings fixed in a permanently open position, which are located between smoke control zones by the use of the airflow method, shall be permitted. The design airflow shall be in accordance with this section. Airflow shall be directed to limit smoke migration from the fire zone. The geometry of openings shall be considered to prevent flow reversal from turbulent effects.

909.7.1 Velocity. The minimum average velocity through a fixed opening shall not be less than:

$v = 217.2\ [h\ (T_f - T_o)/(T_f + 460)]^{1/2}$ **(Equation 9-2)**

For SI: $v = 119.9\ [h\ (T_f - T_o)/T_f]^{1/2}$

where:

h = Height of opening, feet (m).
T_f = Temperature of smoke, °F (K).
T_o = Temperature of ambient air, °F (K).
v = Air velocity, feet per minute (m/minute).

909.7.2 Prohibited conditions. This method shall not be employed where either the quantity of air or the velocity of the airflow will adversely affect other portions of the smoke control system, unduly intensify the fire, disrupt plume dynamics or interfere with exiting. In no case shall air flow toward the fire exceed 200 feet per minute (1.02 m/s). Where the formula in Section 909.7.1 requires airflow to exceed this limit, the airflow method shall not be used.

909.8 Exhaust method. When approved by the fire code official, mechanical smoke control for large enclosed volumes, such as in atriums or malls, shall be permitted to utilize the exhaust method. Smoke control systems using the exhaust method shall be designed in accordance with NFPA 92B.

909.8.1 Smoke layer. The height of the lowest horizontal surface of the accumulating smoke layer shall be maintained at least 6 feet (1829 mm) above any walking surface that forms a portion of a required egress system within the smoke zone.

909.9 Design fire. The design fire shall be based on a rational analysis performed by the registered design professional and approved by the fire code official. The design fire shall be based on the analysis in accordance with Section 909.4 and this section.

909.9.1 Factors considered. The engineering analysis shall include the characteristics of the fuel, fuel load, effects included by the fire and whether the fire is likely to be steady or unsteady.

909.9.2 Separation distance. Determination of the design fire shall include consideration of the type of fuel, fuel spacing and configuration.

$R= [Q/(12\pi q'')]^{1/2}$ **(Equation 9-8)**

where:

q'' = Incident radiant heat flux required for nonpiloted ignition, Btu/ft2·s (W/m2).

Q = Heat release from fire, Btu/s (kW).
R = Separation distance from target to center of fuel package, feet (m).

909.9.3 Heat-release assumptions. The analysis shall make use of best available data from approved sources and shall not be based on excessively stringent limitations of combustible material.

909.9.4 Sprinkler effectiveness assumptions. A documented engineering analysis shall be provided for conditions that assume fire growth is halted at the time of sprinkler activation.

909.10 Equipment. Equipment including, but not limited to, fans, ducts, automatic dampers and balance dampers, shall be suitable for its intended use, suitable for the probable exposure temperatures that the rational analysis indicates and as approved by the fire code official. Provide fire/smoke dampers at shaft enclosures, Section 716.5.3 exceptions 1.3 and 1.4 are not permitted. Provide fire damper rating of no less the 250 Deg. F. For systems where the probable temperature rise to which the damper will be exposed may be higher the 250 Deg. F the temperature shall be computed in 909.10.1.

909.10.1 Exhaust fans. Components of exhaust fans shall be rated and certified by the manufacturer for an operating temperature rating of no less than 250 Deg F. For systems where the probable temperature rise to which the components will be exposed may be higher than 250 degrees F. then the temperature rise shall be computed by:

$T_s = (Q_c/mc) + (T_a)$ **(Equation 9-9)**

where:

c = Specific heat of smoke at smoke layer temperature,
Btu/lb°F · (kJ/kg · K).
m = Exhaust rate, pounds per second (kg/s).
Q_c = Convective heat output of fire, Btu/s (kW).
T_a = Ambient temperature, °F (K).
T_s = Smoke temperature, °F (K).

Exception:

Reduced T_s as calculated based on the assurance of adequate dilution air.

909.10.2 Ducts. Duct materials and joints shall be capable of withstanding the probable temperatures and pressures to which they are exposed during smoke control operating conditions. Ducts shall be constructed and supported in accordance with the *International Mechanical Code*. Ducts shall be leak tested to 1.5 times the maximum design pressure in accordance with nationally accepted practices. Measured leakage shall not exceed 5 percent of design flow. Results of such testing shall be a part of the documentation procedure. Ducts shall be supported directly from fire-resistance-rated structural elements of the building by substantial, noncombustible supports.

Exception:

Flexible connections (for the purpose of vibration isolation) complying with the *International Mechanical Code*, that are constructed of approved fire-resistance-rated materials.

909.10.3 Equipment, inlets and outlets. Equipment shall be located so as to not expose uninvolved portions of the building to an additional fire hazard. Outside air inlets shall be located so as to minimize the potential for introducing smoke or flame into the building. Exhaust outlets shall be so located as to minimize reintroduction of smoke into the building and to limit exposure of the building or adjacent buildings to an additional fire hazard.

909.10.4 Automatic dampers. Automatic dampers, regardless of the purpose for which they are installed within the smoke control system, shall be listed and conform to the requirements of approved, recognized standards.

909.10.5 Fans. In addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty, with the minimum number of belts being two. Fans shall be selected for stable performance based on normal temperature and, where applicable, elevated temperature. Calculations and manufacturer's fan curves shall be part of the documentation procedures. Fans shall be supported and restrained by noncombustible devices in accordance with the requirements of Chapter 16. Motors driving fans shall not be operated beyond their nameplate horsepower (kilowatts), as determined from measurement of actual current draw, and shall have a minimum service factor of 1.15.

909.11 Power systems. The smoke control system shall be supplied with two sources of power. Primary power shall be from the normal building power system. Secondary power shall be from an approved emergency source complying with the ICC *Electrical Code*. The emergency power source and its transfer switches shall be in a separate room from the

normal power transformers and switch gear and shall be enclosed in a room constructed of not less than 1-hour fire barriers ventilated directly to and from the exterior. Power distribution from the two sources shall be by independent routes. Transfer to full emergency power shall be automatic and within 10 seconds of failure of the primary power. The systems shall comply with this code or the ICC *Electrical Code*.

909.11.1 Power sources and power surges. Elements of the smoke management system relying on volatile memories or the like shall be supplied with uninterruptible power sources of sufficient duration to span a 15-minute primary power interruption. Elements of the smoke management system susceptible to power surges shall be suitably protected by conditioners, suppressors or other approved means.

909.12 Detection and control systems. Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Section 907. Such systems shall be equipped with a control unit complying with UL 864 and listed as smoke control equipment. Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override, and, through a preprogrammed weekly test sequence, report abnormal conditions audibly, visually and by printed report.

909.12.1 Wiring. In addition to meeting requirements of the ICC *Electrical Code*, all wiring, regardless of voltage, shall be fully enclosed within continuous raceways in mechanical rooms, electrical rooms, elevator equipment rooms and vertical risers. Wiring shall not be painted.

909.12.2 Activation. Smoke control systems shall be activated in accordance with Section 907.

909.12.2.1 Pressurization, airflow or exhaust method. Mechanical smoke control systems using the pressurization, airflow or exhaust method shall have completely automatic control.

909.12.2.2 Passive method. Passive smoke control systems actuated by approved spot-type detectors listed for releasing service shall be permitted.

909.12.3 Automatic control. Refer to Section 907.2.

909.13 Control air tubing. Control air tubing shall be of sufficient size to meet the required response times. Tubing shall be flushed clean and dry prior to final connections and shall be adequately supported and protected from damage. Tubing passing through concrete or masonry shall be sleeved and protected from abrasion and electrolytic action.

909.13.1 Materials. Control air tubing shall be hard drawn copper, Type L, ACR in accordance with ASTM B 42, ASTM B 43, ASTM B 68, ASTM B 88, ASTM B 251 and ASTMB280. Fittings shall be wrought copper or brass, solder type, in accordance with ASME B 16.18 or ASME B16.22. Changes in direction shall be made with appropriate tool bends. Brass compression-type fittings shall be used at final connection to devices; other joints shall be brazed using a BCuP5 brazing alloy with solids above 1,100°F (593°C) and liquids below 1,500°F (816°C). Brazing flux shall be used on copper-to-brass joints only.

Exception:

Nonmetallic tubing used within control panels and at the final connection to devices, provided that all of the following conditions are met:

1. Tubing shall be listed by an approved agency for flame and smoke characteristics.
2. Tubing and connected devices shall be completely enclosed within galvanized or paint- grade steel enclosure of not less than 0.030 inch (0.76 mm) (No. 22 galvanized sheet gage) thickness. Entry to the enclosure shall be by copper tubing with a protective grommet of neoprene or Teflon or by suitable brass compression to male-barbed adapter.
3 Tubing shall be identified by appropriately documented coding.
4. Tubing shall be neatly tied and supported within enclosure. Tubing bridging cabinet and door or moveable device shall be of sufficient length to avoid tension and excessive stress. Tubing shall be protected against abrasion. Tubing serving devices on doors shall be fastened along hinges.

909.13.2 Isolation from other functions. Control tubing serving other than smoke control functions shall be isolated by automatic isolation valves or shall be an independent system.

909.13.3 Testing. Control air tubing shall be tested at three times the operating pressure for not less than 30 minutes without any noticeable loss in gauge pressure prior to final connection to devices.

909.14 Marking and identification. The detection and control systems shall be clearly marked at all junctions, accesses and terminations.

909.15 Control diagrams. Identical control diagrams showing all devices in the system and identifying their location and function shall be maintained current and kept on file with building management and in the fire command center in an approved format and manner.

909.16 Firefighter's smoke control panel. A firefighter's smoke control panel meeting the requirements of UL 864 and listed for smoke control under UL product category guide designation UUKL shall be provided and shall include manual control or override of automatic control for mechanical smoke control systems. Upon an alarm, the fire alarm system shall take direct control of all smoke control system components such as fans, dampers, activation of dedicated pressure control systems and status indication. The fire alarm system shall provide a signal to any temperature control or building automation systems for HVAC system enable/disable control and status. Where HVAC systems are utilized for smoke control the fire alarm system shall take direct control of those HVAC system components utilized for smoke control. Hard-wired interlock is acceptable. The fire alarm system shall provide automatic and manual override control and status. Terminal air distribution units may remain under their own normal building automation control. The panel shall be located in a fire command center complying with Section 509 in high rise buildings or buildings with smoke-protected assembly seating. In all other buildings, the firefighter's smoke control panel shall be installed in an approved location adjacent to the fire alarm control panel. The firefighter's smoke control panel shall comply with IFCA Sections 909.16.1 through 909.16.3.

909.16.1 Smoke control systems. The firefighter's control panel shall be provided for manual or override of automatic control of mechanical smoke control systems. This panel shall graphically depict the individual smoke control system fan and damper controls, their relative location within the building, stairwells, hoistways, building pressurization and exhaust airflow, refuge area pressurization and all other smoke control zones that apply. This panel shall clearly show the building arrangement and smoke control zones served by the systems. The graphic panel shall be oriented to the building and include a North reference compass point. A combination of vertical (section) and/or horizontal (plan) graphic arrangement may be necessary. The operating control and status indicators on the FSCP shall have a maximum height from the floor of 6 feet, 6 inches and a minimum of 2 feet, 0 inches, and may require more than one section to accommodate height limitations. Layout, labeling and location of the fire fighters control panel shall be reviewed and approved by Fire Department prior to fabrication. The following features shall be incorporated and color-coded as follows:

1. General building layout (black lines on white background)
2. Exhaust systems – RED
3. Pressurization systems – GREEN
4. Garage supply and exhaust systems shall be energized manually to purge smoke (On – OFF only). System need not be connected to emergency power. The status of smoke control equipment shall be indicated by LED lamps and appropriate legends. Fans, major ducts and dampers within the building that are components of the smoke control systems shall be clearly identified as to purpose (e.g. STAIR PRESSURIZATION FAN) on the FSCP. Lettering shall be 16 point Helvetica bold; equipment identification (e.g. SPF-1) shall be 12 point Helvetica bold.

LED status indicators shall be provided for each component of the smoke control system as follows:

1. Fans operating, dampers open, power on – GREEN
2. Fans off, dampers closed – YELLOW
3. Fans and dampers in automatic mode shall indicate a fault status - YELLOW.
4. Duct detectors as required per Section 907.12 shall be identified - YELLOW.
5. Provide lamp test with momentary contact push button(s) to illuminate all LED's simultaneously.
6. All status LED's shall be active all the time.
    a. Control switches are active only during alarm condition except through a secured and supervised bypass method approved by the Fire Department.

909.16.2 Smoke control panel. The firefighter's control panel shall provide control capability over the complete smoke-control system equipment within the building as follows:

1. ON-AUTO-OFF control over each individual piece of operating smoke control equipment that can also be controlled from other sources within the building. This includes stairway pressurization fans; smoke exhaust fans; supply, return and exhaust fans; elevator shaft fans and other operating equipment used or intended for smoke control purposes.
2. OPEN-AUTO-CLOSE control over individual dampers relating to smoke control and that are also controlled from other sources within the building.
3. ON-OFF or OPEN-CLOSE control over smoke control and other critical equipment associated with a fire or smoke emergency and that can only be controlled from the fire-fighter's control panel.

   Exceptions:

   1. Complex systems, where approved by the Denver Fire Department, where the controls and indicators are combined to control and indicate all elements of a single smoke zone as a unit.
   2. Complex systems, where approved by the Denver Fire Department, where the control is accomplished by computer interface using approved, plain English commands.

909.16.3 Control action and priorities. The firefighter's control panel actions shall be as follows:

1. ON-OFF and OPEN-CLOSE control actions shall have the highest priority of any control point within the building. Once issued from the firefighter's control panel, no automatic or manual control from any other control point within the building shall contradict the control action. Where automatic means are provided to interrupt normal, nonemergency equipment operation or produce a specific result to safeguard the building or equipment (i.e., duct freezestats, duct smoke detectors, high-temperature cutouts, temperature-actuated linkage and similar devices), such means shall be capable of being overridden by the fire-fighter's control panel. The last control action as indicated by each fire-fighter's control panel switch position shall prevail. In no case shall control actions require the smoke control system to assume more than one configuration at any one time.

   Exception:

   Power disconnects required by the ICC *Electrical Code*.

2. Only the AUTO position of each three-position fire-fighter's control panel switch shall allow automatic or manual control action from other control points within the building. The AUTO position shall be the NORMAL, nonemergency, building control position. Where a firefighter's control panel is in the AUTO position, the actual status of the device (on, off, open, closed) shall continue to be indicated by the status indicator described above. When directed by an automatic signal to assume an emergency condition, the NORMAL position shall become the emergency condition for that device or group of devices within the zone. In no case shall control actions require the smoke control system to assume more than one configuration at any one time.

909.17 System response time. Smoke control system activation shall be initiated immediately after receipt of an appropriate automatic or manual activation command. Smoke control systems shall activate individual components (such as dampers and fans) in the sequence necessary to prevent physical damage to the fans, dampers, ducts and other equipment. The total response time for individual smoke control systems to achieve their desired operating mode shall not exceed the following time periods:

Fan operating at desired state – 75 seconds

Damper position travel – 60 seconds

909.18 Testing of smoke control systems. Before the Fire Department accepts the smoke control systems and prior to initial occupancy, the smoke control systems shall be tested in their presence to confirm that the systems operate in compliance with this Section. In addition, all smoke control systems shall be tested annually and shall be maintained to perform its intended purpose under the code version with which it was built.

909.18.1 Acceptance testing. The requirements of acceptance testing defined hereinafter shall be the minimum requirements. All acceptance tests shall be witnessed by a Fire Department representative.

1. Furnish a testing procedure, reviewed by the smoke control system design professional engineer, to the Fire Department 72 hrs in advance of the acceptance tests being performed. The procedure shall define how compliance with the Code will be demonstrated. The procedure shall also identify what instrumentation, including artificial smoke generating equipment, will be used during the testing.
2. Smoke control systems testing shall include the following subsystems to the extent that they affect the operation of the smoke-control system:
    a. Fire alarm system (See NFPA 72, *National Fire Alarm Code*)
    b. Building Automation & Temperature Control System
    c. HVAC equipment
    d. Electrical equipment
    e. Power sources including Emergency or Standby power
    f. Automatic suppression systems
    g. Automatic operating doors and closers
    h. Dedicated and Non-dedicated smoke-control systems
    i. Emergency elevator operation
3. Prior to witnessed acceptance testing of the smoke control systems, the design professional engineer shall confirm and advise the Fire Department in writing that the entire smoke control system has been installed, air balanced and tested in accordance with its design, plans, specifications and this Code.
4. The following shall be notified so that they may witness the acceptance testing:
    a. Design Professional Engineer-of-Record
    b. Building contractor
    c. Owner's representative
    d. Denver Fire Department
    e. Denver Building Department
5. Unless otherwise approved by the Fire Department, sufficient smoke shall be generated to produce at least the volume of the smoke zone being tested within approximately 5 minutes. All smoke-generating devices shall be supplied by the owner or his representative and shall meet with the approval of the Fire Department.
6. Acceptance testing shall demonstrate that the correct outputs are produced for a given input for each control sequence specified. The following control sequences shall demonstrate complete smoke-control sequence.
    a. Normal mode
    b. Automatic smoke-control mode for first alarm
    c. Manual override of normal and automatic smoke-control modes
    d. Return to normal
7. After the smoke control system is activated, smoke shall not continue to migrate to other smoke zones of the building.
8. Smoke control systems shall demonstrate the ability to inhibit smoke from migrating across smoke zone boundaries to other areas and containment within the active smoke zone. Smoke control system shall also demonstrate the continual reduction of smoke concentration from within the active smoke zone.

909.18.2 Testing requirements: Tests shall be performed in full automatic mode with the building operating under both normal power and emergency power. Test equipment shall include; manometer (calibrated within last 12 months), spring scale and other equipment as necessary to adequately measure and record system performance. Communications shall be provided between the test locations and the fire command center.

1. For a building that is not a high rise, multiple tests on more than one floor or smoke zone shall be required to demonstrate proper operation.
2. For high rise buildings, tests shall be conducted at a minimum of 5 locations.
    a. A floor in the lower third, a floor in the middle third and a floor in the upper third of the building.
    b. With a floor in alarm, an additional automatic alarm shall be initiated on a floor immediately above or below the initial floor in alarm. All floors in alarm shall go to exhaust mode
    c. With a floor in alarm, a manual pull station on another floor shall be activated. Smoke control operation shall not be affected.
    d. For atriums, more than one test may be required depending upon the atrium configuration, its relationship to adjacent spaces and if the atrium is located in a high-rise.
    e. Activation of one smoke detector in each smoke control zone on each floor being tested
    f. Activation of at least one sprinkler flow switch.
    g. Activation of at least one manual pull station.
3. For high rise buildings, pressure differentials shall be measured across stairway doors, across elevator/lobby/refuge corridor area doors and adjoining spaces, between atriums and areas immediately adjacent to atriums where atriums are part of a high rise building. Door opening force into stair enclosures or refuge areas shall not exceed 30 lbs. under any conditions.
4. Upon activation of the fire alarm system for each test, confirm that the smoke control system fans and dampers have assumed the correct operating condition for the type of alarm initiating device and the location of the initiating device. This shall be confirmed also at the smoke control panel in the fire command center.
5. Manually override the operation of a sampling of fans and dampers during each test, taking care not to damage system components. Return all override switches to their “auto” position after each test.

909.18.3 Annual tests. Annual tests shall be performed in accordance with 909.18.3.1 and 909.18.3.2, on all smoke control systems including those installed prior to adoption of this code. It is recognized that smoke control systems installed prior to adoption of this Code could have parameters that are different than those described in this Section. In those cases, smoke control tests shall be adjusted accordingly to meet the intent of this section.

909.18.3.1 Equipment operating tests. The following equipment operating tests shall be conducted annually on the smoke control system components:

1. Verify the proper control and status indication of smoke control dampers (i.e., "OPEN/CLOSED") and fans (i.e., "ON/OFF") by visual observation at each damper and fan location and at the smoke control status/control panel in the fire command center.
2. Verify that all smoke control dampers and fans assume the correct operating position under both normal and fire modes and when the manual override switches at the smoke control status/control panel are placed in the "auto" position.
3. Verify that the manual override switches function properly for smoke control dampers and fans.
4. Items l, 2 and 3 above may be performed by qualified service technicians who are familiar with the proper operation of the smoke control systems and equipment. The engineer responsible for conducting the smoke control system performance tests shall develop the test procedures to be used and review the results obtained by the service technicians, including an actual sampling to confirm the accuracy of the test. A statement summarizing this review shall be included in the performance test report described in section 909.18.4 that is required to be submitted by the engineer to the Fire Department.
5. A copy of the written test procedure and an accurate log of tests shall be maintained in the fire command center and at either the building management office or the maintenance office. A copy of the previous test report shall be submitted to the engineer responsible for the smoke control performance tests for the engineer's review and approval prior to the smoke control test. Any defects, system modifications and repairs shall be recorded in the log. Necessary corrections shall be made prior to the smoke control performance test.

909.18.3.2 Performance tests. Within 30 days after completion of annual equipment operating tests defined above, conduct the following smoke control system performance tests. The annual smoke control systems tests shall be conducted under the direct supervision of a professional engineer qualified in the testing of such smoke control systems.

1. Activate the smoke control systems manually for tests used to confirm minimum pressure differentials defined in this Section.
2. Activate the smoke control systems automatically through the fire alarm system for tests used to confirm proper sequencing of the system components. Measure actual relative pressure differentials between areas in alarm and adjacent areas and actual door opening forces.
3. For high rise buildings, conduct smoke control tests, observations and measurements of all aspects of the smoke control system at a minimum of 3 locations: a floor in the lower third, a floor in the middle third and a floor in the upper third of the building. Smoke control tests in subsequent years shall be conducted on previously untested floors, as may be practical so that all floors ultimately are tested.
4. For all other buildings, conduct smoke control tests, observations and measurements of all aspects of the smoke control system at a minimum number of locations to demonstrate proper performance as approved by the Fire Department. Each test shall attempt to involve as many different fan systems as practical. Smoke control tests in subsequent years shall be conducted on previously untested locations, as may be practical so that all locations ultimately are tested over a three year period.
5. Tests of the smoke control system shall be conducted by activation of at least one smoke detector in each smoke control zone on each floor being tested. One test of at least one of the smoke control zones shall include activation of one sprinkler flow switch. In addition, the smoke control tests shall include activation of at least one manual fire alarm box. For high rise buildings, pressure differentials shall be measured across stairway doors, between floors in alarm and floors immediately above and below floors in alarm, across elevator/lobby/refuge corridor area doors and adjoining spaces in Group R1, R2 or I1 occupancies, and between atriums and areas immediately adjacent to atriums where atriums are part of high rise buildings.
6. Upon activation of the fire alarm system for each test, confirm that the smoke control system fans and dampers have assumed the correct operating condition for the type of alarm initiating device and the location of the initiating device. This shall be confirmed also at the smoke control panel in the fire command center.
7. Manually override the operation of a sampling of fans and dampers during each test, taking care not to damage system components. Return all override switches to their “auto” position after each test.

909.18.4 Test reports. Within 30 days of completing any smoke control test, submit a test report to the Fire Department. A copy of the previous and current test reports shall be kept in the fire command center. The test report shall be written by the professional engineer who conducted the testing. The test report shall bear the seal and signature of the professional engineer. Any defects, modifications and repairs shall be recorded in a log kept in the fire command center and at either the building management office or the maintenance office. The test report shall include, but is not limited to the following:

1. Provide a brief description of the smoke control system installed in the building being tested, and state the year the building received its construction permit for the smoke control system. Provide a sequence of operation for the smoke control system.
2. Describe in general terms the equipment operating test procedures. Include a list of the equipment operating and smoke control test deficiencies along with a schedule of the proposed corrective action.
3. Describe detailed procedures followed during the equipment operating tests. Describe detailed procedures followed during the smoke control tests.
4. List test equipment used and outside air temperature and wind conditions at the time the smoke control tests were conducted.
5. State sequences and timing of the system operations during all smoke control tests (e.g., smoke detector activation time, fan start times, time for dampers to assume the correct position, etc.)
6. List the location of test measurements and the measured values for pressure differentials and door-opening forces for each test location.

7. Record any operational defects and performance deficiencies with respect to the requirements of this Section, and state recommendations for corrective action. Include a schedule to re-test each deficiency. Submit results of any subsequent tests performed after completion of the corrective action.

8. Engineer's assessment indicating that the smoke control system, as installed and tested, conforms to the requirements of Section 909.

909.18.5 System repairs and maintenance. All deficiencies noted in the annual report will be corrected within 30 days and, if required by the engineer, the smoke control system shall be re-tested. All smoke control systems will be maintained to perform its intended purpose under the code version with which it was built. As stated in IFC Section 107.5, correction and abatement of violations of this code shall be the responsibility of the owner. With approval of the Denver Building Department and the Denver Fire Department smoke control systems may be remodeled to comply with current code.

909.19 System acceptance. Buildings, or portions thereof, required by this code to comply with this section shall not be issued a certificate of occupancy until such time that the fire code official determines that the provisions of this section have been fully complied with and that the fire department has received satisfactory instruction on the operation, both automatic and manual, of the system.

Exception:

In buildings of phased construction, a temporary certificate of occupancy, as approved by the fire code official, shall be allowed provided that those portions of the building to be occupied meet the requirements of this section and that the remainder does not pose a significant hazard to the safety of the proposed occupants or adjacent buildings.

909.20 Smokeproof enclosures. For buildings required to comply with Section 403 or 405, a smokeproof enclosure shall consist of an enclosed, pressurized stairway conforming to IBCA Section 1020.1and IFCA Section 909.21.

909.20.1 Construction. Smokeproof vertical exit enclosures shall be separated from the remainder of the building by not less than a 2-hour fire-resistance-rated fire barrier without openings other than the required means of egress doors. The open exterior balcony shall be constructed in accordance with the fire-resistance-rating requirements for floor construction.

909.20.1.1 Door closers. Doors in a smokeproof enclosure shall be self-closing or shall be automatic closing by actuation of a smoke detector installed at the floor-side entrance to the smokeproof enclosure. The actuation of the smoke detector on any door shall activate the closing devices on all doors in the smokeproof enclosure at all levels. Smoke detectors shall be installed in accordance with Section 907.10.

909.20.2 Stair pressurization alternative. Stairway pressurization shall comply with Section 909.21.4

909.20.3 Ventilating equipment. The activation of ventilating equipment shall be as required in Section 907.2.

909.20.3.1 Ventilation systems. Smokeproof enclosure ventilation systems shall be independent of other building ventilation systems. The equipment and ductwork shall comply with one of the following:

1. Equipment and ductwork shall be located exterior to the building and directly connected to the smokeproof enclosure or connected to the smokeproof enclosure by ductwork enclosed by 2-hour fire barriers.

2. Equipment and ductwork shall be located within the smokeproof enclosure with intake or exhaust directly from and to the outside or through ductwork enclosed by 2-hour fire barriers.

3. Equipment and ductwork shall be located within the building if separated from the remainder of the building, including other mechanical equipment, by 2-hour fire barriers.

909.20.3.2 Emergency power. Mechanical hoistway and stair shaft ventilation systems and automatic fire detection systems shall be powered by an approved emergency power system conforming to IFC Section 403.10.1 and Chapter 27.

909.20.3.3 Acceptance and testing. In accordance with Section 909.18.

909.21 Alternative design approach

909.21.1 Scope and purpose. The alternative approach for the design of smoke control systems, which is described in this Section, has been developed over 25 years within the City of Denver and uses a prescriptive approach for the

design, installation and performance verification of smoke control systems and applies to mechanical smoke control systems. The purpose of this Section is to establish minimum requirements for the design and installation of smoke control systems, which are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of content or for assistance in fire suppression or overhaul activities. Nothing within these requirements is intended to apply when smoke control is not otherwise required by this Code. Smoke control systems will not be accepted as a substitute for automatic fire sprinkler system protection.

909.21.2 Design criteria.

909.21.2.1 Minimum pressure differential. The minimum pressure differential across stairway and hoistway fire and smoke proof enclosures, on non-fire floors, shall be 0.05-inch water gauge (0.0124 kPa), positive from the stairway or hoistway to the fire floor.

909.21.2.2 Maximum door opening force. The maximum pressure difference across a fire barrier shall be determined by the required door-opening or door-closing forces. Door opening force shall not exceed 30 pounds applied horizontally at the latch side of the door on the door-opening device under any operating condition. Maximum door opening force shall not exceed 15 pounds during a non-fire mode of operation.

909.21.2.3 Resistance to smoke recirculation. Locate outdoor air intakes for pressurization systems remote from points of discharge for smoke exhaust systems, in order to minimize the potential for recirculation of smoke to the outdoor air intakes. The minimum separation distance shall be 10 ft. in any direction.

909.21.2.4 Determination of the volume of a space. Certain prescriptive criteria contained within this alternative design approach are associated with the sizing of smoke control systems. The volume of a given building element shall be defined as the space that is contained between the finished floor slab(s) of one level and the underside of the floor or roof element above, and the walls or partitions that form the boundaries of the space.

909.21.2.5 Fire/Smoke damper temperature rating. The temperature rating for the fusible link in fire and combination fire/smoke dampers, where they are applied in smoke exhaust systems, shall be no less than 250 Deg. F. For systems where the probable temperature rise to which the damper will be exposed may be higher than 250 Deg. F the temperature shall be computed as in 909.10.1.

909.21.3 Smoke control systems for atriums (where required by Section 404).

909.21.3.1 Requirements. The prescriptive approach described hereinafter may be used when approved by the Denver Fire Department. The operation of the smoke control systems shall be controlled through the fire alarm system and shall comply with the requirements of this Section. The atrium volume shall include all spaces not separated from the atrium by the provisions of IBC Section 404.5.

909.21.3.2 Atriums 55 feet or less in height with a volume of 600,000 cubic feet or less. The system shall exhaust a minimum of six air changes per hour. Gravity supply or fan powered supply shall be provided within 10 feet of the lowest level of the atrium and shall be sized for 75 percent of the exhaust air rate. A maximum velocity of 200 feet per minute shall be maintained across the net free area of the supply air openings.

909.21.3.3 Atriums 55 feet or less in height with a volume in excess of 600,000 cubic feet. The system shall exhaust a minimum of four air changes per hour. Gravity supply or fan powered supply shall be provided within 10 feet of the lowest level of the atrium and shall be sized for 75 percent of the exhaust air rate. A maximum velocity of 200 feet per minute shall be maintained across the net free area of the supply air openings

909.21.3.4 Atriums in excess of 55 feet in height. The system shall exhaust a minimum of four air changes per hour. A minimum of 50 percent of the volume of supply air shall be sized and introduced via gravity supply or fan powered inlets within 10 feet of the lowest level of the atrium. The total volume of supply air shall be 75 percent of the required volume of exhaust air.

909.21.3.5 Exhaust openings. Exhaust openings shall be located in the ceiling or in a smoke trap area immediately adjacent to the ceiling at the top of the atrium. The lowest level of the exhaust openings shall be above the top of the highest elevation of door openings into the atrium.

909.21.4 Smoke control systems for high-rise buildings.

909.21.4.1 Stairway pressurization systems.

909.21.4.1.1 Requirements. Each interior enclosed exit stairway and associated exit passageway shall be mechanically pressurized with outdoor air, via a separate, dedicated pressurization system. The operation of

each stairway pressurization system shall be controlled through the fire alarm system, as described in subsequent Articles of this Section. Stairway pressurization system ductwork shall not include fire or smoke dampers; however, isolation dampers may be included in the outdoor air intake ductwork systems, where such dampers are controlled via hard-wired interlock, and are configured to be "fail" open from a control standpoint.

909.21.4.1.2 Operation. Each stairway pressurization system shall be enclosed in a two-hour fire-resistive enclosure, from the outdoor air intake to the stairway enclosure penetration. Each fan discharge shall be provided with a duct smoke detector that shall be annunciated as a supervisory signal at the fire command center (graphic panel) and illuminate a lamp adjacent to the fan status indicator on the firefighters smoke control panel. The capability to manually override the operation of each fan shall be provided to Fire Department personnel in the fire command center. Fans shall not shut off until manually overridden by Fire Department personnel or until the fire alarm system is reset.

909.21.4.1.3 Design. The air volume introduced into the stairway shall be as follows: 15 floors or less, at least 1,000 cfm per floor; 16 floors or more, at least 15,000 cfm, plus 200 cfm per floor level in excess of 15 floors with 1.0 inch w.c. static pressure minimum at duct penetration into the stairway. Static pressure control shall be provided for stairway pressurization fan systems. Variable frequency drives may be utilized for this purpose.

909.21.4.2 Hoistway pressurization systems.

909.21.4.2.1 Requirements. Each elevator hoistway shall be mechanically pressurized with outside air, via a separate, dedicated pressurization system. The operation of each hoistway pressurization system shall be controlled through the fire alarm system. Elevator hoistway pressurization system ductwork shall not include fire or smoke dampers; however, isolation dampers may be included, in the outdoor air intake ductwork systems, where such dampers are controlled via hardwired interlock, and are configured to be "fail" open from a control standpoint.

909.21.4.2.2 Operation. Each pressurization system shall be enclosed in a two-hour fire resistive enclosure, from outside air intake to the hoistway penetration. Each fan discharge shall be provided with a duct smoke detector that shall be annunciated as a supervisory signal at the fire command center graphic panel and illuminate a lamp adjacent to the fan status indicator on the firefighters smoke control panel. Fans shall not shut off until manually overridden by Fire Department personnel or until the fire alarm system is reset.

909.21.4.2.3 Design. Elevator hoistway pressurization systems shall be sized for a minimum of 15,000 CFM per bank (shaft) of elevators, plus 300 CFM per door opening per floor, with 1.0 inch water gauge static pressure, minimum, at the duct penetration into hoistway. Static pressure control shall be provided for hoistway pressurization fan systems. Variable frequency drives may be utilized for this purpose. Hoistway pressurization system performance shall not interfere with the opening and closing of elevator doors. Refer to Chapter 30 for door activation.

909.21.4.2.4 Smoke venting to exterior. Smoke venting of pressurized elevator hoistways to the exterior of the building shall not be required.

909.21.4.2.5 Elevator machine rooms. Elevator machine rooms may be pressurized indirectly via the elevator hoistway pressurization system through the cable slots in the machine room floor.

909.21.4.2.6 Lobby/Refuge areas. Elevator lobbies designated as refuge areas may have the elevator lobby/refuge area pressurized using the elevator hoistway pressurization system by transferring air to the elevator lobby/refuge area from the hoistway. Use of transfer openings protected with fire/smoke dampers between the hoistway and the lobby/refuge area is acceptable.

909.21.4.3 General building smoke exhaust.

909.21.4.3.1 Requirements. A general smoke exhaust system(s) shall be provided in buildings with a high-rise classification, for the occupancies indicated. This system(s) shall be controlled via the fire alarm system, to operate in conjunction with the other applicable smoke control systems for the building, in order to achieve the objectives as follows: 1) To maintain a zone of negative pressure on the fire floor (or smoke zone) relative to the other floors or smoke zones, and 2) To maintain a maximum stairway door opening force on the fire floor. The prescriptive approach described hereinafter is not intended to preclude the use of a performance-

based approach, such as that defined by NFPA, for smoke control; however, the values listed hereinafter represent the minimum level of performance that must be achieved.

909.21.4.3.2 Configuration. The general smoke exhaust system shall include motorized combination fire/smoke dampers or a motorized smoke and a fire damper on each floor of a multi-level building served by the system(s). The exhaust damper(s) on the fire floor shall be commanded open, in order to exhaust that floor, and the smoke exhaust fan commanded to the operating mode. The exhaust dampers on the non-fire floors shall be driven to, or shall remain in, the closed position. The use of smoke dampers shall not preclude the provision of fire dampers, where required by other Sections of this code.

909.21.4.3.3 Design criteria. The general building smoke exhaust system(s) for each floor/smoke zone shall be sized in accordance with the following: 1) The assumption that make-up air will be available on the fire floor; 2) The smoke exhaust system shall be sized to remove a minimum of five air changes per hour on the fire floor in Occupancy Groups A, B, E and M; 3) The smoke exhaust system shall be sized to remove a minimum of fifteen air changes per hour in the typical floor corridors, the typical floor corridors/elevator lobbies, or the typical floor elevator lobbies in Occupancy Groups R1, R2, I1 and I3; 4) That appropriate consideration be made for damper leakage on non-fire floors connected to a central riser system, when selecting the smoke exhaust fan(s).

909.21.4.3.4 Street level retail exception. General building pressurization and smoke exhaust systems will not be required to serve individual retail areas located on the level of egress and that have at least one exit directly to the exterior.

909.21.4.4 Smoke control systems for parking garages within high rise structures.

909.21.4.4.1 Requirements. Elevator lobbies designated as refuge areas on all floors within an enclosed parking structure shall have the elevator lobby/refuge area pressurized using the elevator hoistway pressurization system by transferring air to the elevator lobby/refuge area. Use of transfer openings protected with fire/smoke dampers between the hoistway and the lobby/refuge area is acceptable.

909.21.4.4.2 Open parking garages. A general building smoke control system shall not be required for elevator lobbies that are enclosed and that serve an open parking garage, if direct access without stairs or obstructions is available for people with special needs to exit from the elevator lobby to the open parking garage level or directly to a public way.

909.21.4.4.3 Enclosed garages. Exhaust fans associated with an enclosed parking structure shall be capable of manual operation from the fire command center. Such exhaust fans will not require a redundant source of electrical power, and this shall be indicated at the fire command center with the words, "Not on Emergency Power".

909.21.5 General building smoke exhaust for large spaces.

909.21.5.1 Requirements. Each floor area shall be a compartment and smoke control zone not to exceed 52,000 square feet on a single floor. Smoke control zones shall be separated from each other by a wall that shall extend from the floor to the underside of the floor or roof above, except for the following:

1. Openings into atriums.
2. Pedestrian bridges between two buildings.
3. Non-required stair enclosures between floors.
4. Open escalators between multiple floors.

909.21.5.2 Design criteria. Building construction shall be configured in order to support the performance of the general building smoke exhaust system, in accordance with the following:

1. Draft stops shall be provided between smoke control zones without wall separation, in order to prevent migration of smoke throughout the building, whereby the configuration of the draft stops shall be approved by the Building and Fire Departments.
2. A smoke control zone in alarm shall actuate the respective general building smoke exhaust system, while the smoke exhaust systems in the adjacent smoke control zones shall remain inactive.

3. The minimum static pressure differential shall be maintained in the adjacent non-fire zones, with respect to the smoke control zones in alarm, where smoke control zones have wall separations.
4. Sprinkler zones shall coincide with smoke zones.
5. Products of combustion must be demonstrated to be contained within the zone of origin, for smoke zones without wall separations, and the failure to restrict products of combustion to the floor or area of origin will be considered as not complying with the requirements for the smoke control system.

909.21.6 Smoke control systems for covered mall buildings (where required by Section 404).

909.21.6.1 Requirements. A mechanically operated smoke control system, which shall operate to restrict smoke to the general area of fire origin and to maintain the exiting system in a condition that is safe for exiting, shall be installed in covered mall buildings.

909.21.6.2 Smoke control systems for tenant space and anchor stores.

909.21.6.2.1 Requirements. The spaces shall be compartmentalized into smoke control zones not to exceed 52,000 square feet on a single floor. Except for openings between the covered mall area and tenant spaces, smoke control zones shall be separated from each other by wall construction having a fire resistance rating per IBC Section 402.7.2 and 402.7.3. The walls shall extend from the floor to the underside of the floor or roof above.

909.21.6.2.2 Design criteria. The tenant space and anchor store smoke control exhaust system shall be sized to exhaust a minimum of 6 air changes per hour or 20,000 cfm from each smoke control zone, whichever is greater.

909.21.6.3 Smoke control systems for covered mall areas.

909.21.6.3.1 Requirements. A smoke exhaust system shall be provided to serve covered mall areas. Smoke exhaust locations shall be configured in order to preclude accumulation of smoke in any area of the covered mall. The smoke exhaust system shall be activated by the fire alarm system. If multiple smoke control zones for the mall area are provided either by zone area requirements of this Section or by system design, then only the smoke exhaust system for the zone in alarm shall be activated. Smoke exhaust systems for adjacent covered mall zones shall not operate.

909.21.6.3.2 Design criteria. The smoke control equipment for the covered mall areas shall be separate from that serving tenant spaces. The covered mall area smoke removal system shall provide at least 6 air changes per hour.

909.21.7 Smoke control for large assembly areas.

909.21.7.1 Requirements. A mechanically operated air-handling system, which shall restrict the smoke to the general area of fire origin and maintain the exiting system in a condition that is safe for exiting, shall be installed in buildings with assembly areas or similar areas where the occupant load of each area is 1,000 or greater, as calculated per 2006 IBC Section 1004, and smoke control is required per Sections 909.21.3 (atriums) and 909.21.4 (high-rises). The spaces shall be compartmentalized into smoke control zones. Large assembly areas shall be separated from other adjacent areas, or smoke control zones by smoke partitions. Detector zones may not exceed 22,500 square feet and no detector zone shall serve more than one smoke control zone.

Exceptions:

1. Large assembly smoke zones shall be separated from adjacent zones by draft stops located immediately adjacent to each smoke zone. The draft stops shall be at least 18 inches deep. The draft stops shall be of non combustible or limited combustible material that will stay in place before and during sprinkler operation.
2. Large assembly areas smoke zones separation from adjacent smoke zones is not required for ceiling heights 18 feet and greater.

909.21.7.2 Design criteria. The smoke control exhaust system shall exhaust a minimum of 6 air changes per hour or 20,000 cfm from each smoke control zone, whichever is greater.

909.21.8 Retrofit of smoke control systems in existing high rise buildings.

909.21.8.1 Requirements. Smoke control systems shall be maintained in operational condition as required by the code under which the system was installed. System upgrades shall generally comply with the requirements of Section 909. Construction drawings and system sequence of operation shall be submitted for approval. The upgraded system shall be considered the new requirement and documented as approved by the Denver Building Department and the Denver Fire Department. Future work shall not be allowed to adversely affect the performance of the system.

SECTION 910
SMOKE AND HEAT VENTS

Amend Table 910.3 by deleting Option 2 rows under column heading "Occupancy Group and Commodity Classification" for both commodity classes "I-IV" and "High Hazard."

Delete Section 910.3.1.1. Gravity vents.

SECTION 913
FIRE PUMPS

Amend Section 913.1 by adding the following after the last sentence:

Limited service controllers are not permitted.

Add Section 913.6 as follows:

913.6 Fire pump requirement for non-high-rise structures. Where standpipes are required by other provisions of this code, a fire pump shall be provided. Installation of a fire pump is not required subject to the following exceptions. A written request for approval of omission of the fire pump, substantiating compliance with this provision, shall be submitted to the fire department. Where required, fire pump shall have a water flow rate of 500 gpm or the sprinkler system flow demand, whichever results in a larger fire pump. The fire pump shall be capable of delivering the required sprinkler system pressure demand.

Exceptions:

1. The requirement of a fire pump may be waived in all occupancies except H and I occupancies where all of the following are met:
   a. Buildings shall be equipped throughout by an automatic sprinkler system in accordance with IFC Sections 903.3.1.1 or 903.3.1.2 with quick response or residential sprinkler heads.
   b. City water pressure, as tested at the site, must be capable of hydraulically supporting the sprinkler system without a fire pump or augmentation by the Fire Department.
   c. Standpipes shall be installed or be existing and, when a fire pump is not provided, shall be capable of providing water flow as follows:

      For Class I standpipe systems, the minimum flow rate for the hydraulically most remote standpipe shall be 500 gpm, and the calculation procedure shall be in accordance with NFPA 14. The minimum flow rate for additional standpipes shall be 250 gpm per standpipe, with the total not to exceed 1000 gpm for buildings that are sprinklered throughout per NFPA 13 or NFPA 13R. Minimum pressure for system design shall be as required by NFPA 14 with Fire Department pumpers augmenting the system with a maximum flow rate of 1,000 gpm and a maximum pressure of 135 psi at each fire department connection (FDC).
   d. Projects must have approved Fire Department access for fire-fighting apparatus to the building FDC or connections located on the exterior face of the building. The distance from the centerline of fire department access to the primary FDC shall not exceed 50 feet.
   e. If the building floor plate exceeds 12,500 sq. ft., two separate and remote FDCs shall be provided. One FDC shall be within 100 ft of a fire hydrant.
   f. A graphic or a directory type annunciation panel shall be provided. Each level shall be provided with a flow switch and shall be annunciated as a separate zone. The main flow switch shall also be annunciated

as a separate zone. Tamper switches may be annunciated on one zone. Valve monitoring and waterflow alarm and trouble signals shall be distinctly annunciated.

2. The requirement of a fire pump may be waived in mixed-use or single-use open parking garages with standpipes, including those with enclosed parking levels under the open garage. This exception is applicable where the elevation of the highest tier/floor does not exceed 75 ft above the lowest level of Fire Department vehicle access and the following provisions are met:

   a. The building is constructed in accordance with IBC Section 406.3.

   b. Standpipes shall be installed or be existing and, when a fire pump is not provided, shall be capable of providing water flow as follows:

      For Class I automatic dry standpipe systems, the minimum flow rate for the hydraulically most remote standpipe shall be 500 gpm, and the calculation procedure shall be in accordance with NFPA 14. The minimum flow rate for additional standpipes shall be 250 gpm per standpipe, with the total not to exceed 1000 gpm. Minimum pressure for system design shall be as required by NFPA 14 with Fire Department pumpers augmenting the system with a maximum flow rate of 1,000 gpm and a maximum pressure of 135 psi at each fire department connection (FDC).

   c. Standpipes are installed in accordance with IFCA Section 905 and NFPA 14.

   d. Projects must have approved Fire Department access for fire fighting apparatus to the building FDC located on the exterior face of the building. The distance from the centerline of fire department access to the primary FDC shall not exceed 50 feet.

Add Section 915 as follows:

SECTION 915
RADIO ENHANCEMENT SYSTEM

915.1 Radio Enhancement System for underground buildings. All underground buildings shall comply with Department of Safety Radio Enhancement Systems (RES) requirements as defined in IFCA Section 907.2.12.3.3.

915.2 Radio Enhancement System for buildings exceeding 50,000 square feet of building area. All buildings exceeding 50,000 total square feet of floor area shall comply with Department of Safety Radio Enhancement Systems (RES) requirements as defined in IFCA Section 907.2.12.3.3.

The Department of Safety radio frequency range—800 MHz to 870 MHz—shall operate effectively throughout the structure at a radio control channel signal level of no less than -100 dBm at 90% or more of the locations measured within each grid area. Equivalently, the service area reliability shall be 90% or greater on each floor of the structure and parking levels.

Upon completion of major construction and prior to occupancy of the building, radio acceptance testing by Denver Fire Department Technicians or technicians with appropriate knowledge and training who are licensed by the Denver Fire Department shall be performed.

Exception:

Where an RES is not installed at time of construction, an empty two-inch (2”) vertical metallic raceway or conduit shall be provided near each required stairway enclosure and in each elevator lobby. Where the radio signal coverage does not comply with provisions of Sections 915.2 and 907.2.12.3.3, the 2” empty conduits shall be used for installation of RES. Installation of RES shall be completed prior to issuance of the Certificate of Occupancy.

CHAPTER 10

MEANS OF EGRESS

All amendments to Sections 1001 through 1026 of this chapter are located in Chapter 10 of the Denver Amendments to the International Building Code (IBCA).

SECTION 1027
MEANS OF EGRESS FOR EXISTING BUILDINGS

Replace Section 1027.16.3 as follows:

1027.16.3 Dimensions. Fire escape stairs shall meet the minimum width, riser height and tread depth as specified in IBCA Sections 3404.4 and 105.1.

CHAPTER 11

AVIATION FACILITIES

SECTION 1106
AIRCRAFT FUELING

Add Section 1106.12.1 as follows:

1106.12.1 Auxiliary power unit (APU). Fuel servicing shall not be performed on a fixed-wing aircraft while an onboard engine, APU or heater, is operating.

Exception:

In an emergency resulting from the failure of an onboard auxiliary power unit on a jet aircraft, and in the absence of suitable ground support equipment, a jet engine mounted at the rear of the aircraft or on the wing on the side opposite the fueling point shall be permitted to be operated during fueling or defueling to provide power, provided that the operation follows written procedures approved by Denver International Airport and the Denver Fire Department.

SECTION 1107
HELISTOPS AND HELIPORTS

Add Section 1107.9 as follows:

1107.9 Helistops on roofs. In addition to other applicable portions of this Code, helistops located on roofs shall comply with the following:

1. Smoking is prohibited on the roof operating area during landing and takeoff operations.
2. Persons, other than helistop personnel, shall be restricted to designated protected or fenced waiting areas during landing and take-off operations.
3. Loose material such as gravel is prohibited.
4. Openings in the roof shall not be permitted in the immediate landing area.
5. Major repair and maintenance operations are not permitted on the helistop except in cases of emergency, and only with prior notification to the department.
6. Communication facilities shall be provided from the helistop to the department and building personnel for emergency notification.
7. Helistop personnel shall be trained in the use of communication and fire extinguishing equipment.

8. The storage of flammable liquids or highly combustible materials on the roof is prohibited.
9. An exterior (weatherproof) manual pull station shall be provided by each exit and shall be connected to the building alarm system.
10. At least 100 feet of approved 1.5-inch hose equipped with an approved fog nozzle and a 2.5-inch male NST reduced to a 1.5-inch male Denver thread shall be provided in a weatherproof cabinet adjacent to the roof standpipe.

CHAPTER 14
FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION

SECTION 1401
GENERAL

1401.3 Permit Required (Addition)

Add new subsection as follows:

1401.3 Permit required. Permits shall be required as set forth in Section 105.6 for the activities or uses regulated by sections 1403 – Temporary Heating Equipment, 1404.3 – Open Burning, 1404.5 – Fire Watch, 1404.6 – Cutting and Welding, 1405.1 Storage of Flammable and Combustible Liquids, 1405.2 – Class I and Class II Liquids, 1406.1 – Storage and Handling (Flammable Gases), 1407.1 – Storage and Handling (Explosive Materials), 1417 - Safeguarding Roofing Operations, and 1418 – Asbestos Operations.

SECTION 1413
STANDPIPES

Replace Section 1413.1 as follows:

1413.1 Where required. Buildings four or more stories in height shall be provided with not less than one standpipe for use during construction. Such standpipes shall be installed when the progress of construction is not more than 30 feet in height above the lowest level of Fire Department vehicle access or where the floor level of the lowest story is located more than 30 feet below the highest level of Fire Department vehicle access. Such standpipes shall be provided with Fire Department hose connections at accessible locations adjacent to usable stairs. Such standpipes shall be extended as consturction progresses to within one floor of the highest point of construction having secured decking or flooring. One fire department connection [not less than two (2) 2.5-inch inlets with 4-inch piping] shall be provided for buildings less than 200 feet in height. Where building exceeds 200 feet in height, two (2) separate 6-inch manual dry standpipes shall be required. These standpipes shall be located adjacent to a usable stair with a 200 feet maximum separation between standpipes. Each standpipe shall be connected to two (2) 2.5-inch inlet fire department connections. Each fire department connection shall be signed indicating which standpipe it serves. The fire department connection(s) shall be provided at a location visible from the public way, accessible to fire apparatus and approved by Fire Prevention personnel. Refer to IFC Chapter 9.

Add new section as follows:

SECTION 1418
ASBESTOS OPERATIONS

1418.1 General. Operations involving asbestos or asbestos-containing materials in buildings and other structures regulated by this code shall be in accordance with IFC Section 1418.

1418.2 Notification. The fire code official shall be notified 24 hours prior to the commencement and closure of asbestos operations. The permit applicant shall notify the building official when asbestos abatement involves the removal of materials which were used as a feature of the building's fire resistance.

1418.3 Signs. Approved signs shall be posted at the entrance, exit, decontamination areas and waste-disposal areas for asbestos operations. The signs shall state asbestos abatement operations are in progress in the area, asbestos is a suspected carcinogen and proper respiratory protection is required. Signs shall have a reflective surface and lettering shall be a minimum of two inches (51 mm) in height.

CHAPTER 15
FLAMMABLE FINISHES

SECTION 1501
GENERAL

Replace Section 1501.1, Item #4 as follows:

4. Floor surfacing or finishing operations involving flammable finishes.

Replace Section 1501.1, Item #6 as follows:

6. Spraying and dipping operations, including spraying noncombustible materials (water based).

SECTION 1504
SPRAY FINISHING

Replace Section 1504.6.1.2.1, Item #3 as follows:

3. Have the ventilating system maintain a concentration 25 percent below the lower flammable limit (LFL) within the spray booth or spray room during the drying process and automatically shut off drying apparatus in the event of a failure of the ventilating system.

SECTION 1505
DIPPING OPERATIONS

Replace Section 1505.7 as follows:

1505.7 Ventilation of flammable vapor areas. Mechanical ventilation shall be provided to maintain airborne concentrations below 25 percent the lower flammability limit (LFL). Required ventilation systems shall be arranged such that the failure of any ventilating fan shall automatically stop the dipping conveyor system.

SECTION 1510
FLOOR SURFACING AND FINISHING OPERATIONS

Replace Section 1510.1 as follows:

1510.1 Scope. Floor surfacing and finishing operations using Class I or Class II liquids shall comply with IFC Sections 1510.2 through 1510.5.

CHAPTER 16
FRUIT AND CROP RIPENING

SECTION 1603
ETHYLENE GAS

Add Sections 1603.3 and 1603.4 as follows:

1603.3 Storage. Containers other than those connected for use shall be stored outside of ripening process buildings or in a special building.

Exception:

Storage of not more than two portable containers complying with Section 3003.1 and approved for transportation is allowed in ripening process buildings.

1603.4 Piping. Piping containing ethylene shall be constructed of iron. Flexible connectors and hose, when used, shall be of an approved type. Tubing shall be of brass, copper, or stainless steel with not less than 0.049-inch (1.2 mm) wall thickness.

CHAPTER 17
FUMIGATION AND THERMAL INSECTICIDAL FOGGING

SECTION 1701
GENERAL

Replace Section 1701.2 as follows:

1701.2 Permits. No person shall engage in the actual operation of fumigation or thermal insecticidal fogging without first obtaining a permit. No fumigation room, vault, or chamber using toxic or flammable fumigant shall be used or maintained without first obtaining a permit. Permits shall be required as set forth in Section 105.6.

Add Section 1701.3 as follows:

1701.3 License. No person shall conduct fumigation or insecticidal operations without first obtaining a license from the City and County of Denver Department of Excise and Licenses as required by the Revised Municipal Code.

SECTION 1703
FIRE SAFETY REQUIREMENTS

Add Sections 1703.1.1 and 1703.1.2 as follows:

1703.1.1 Usage warning signs. Where fumigants and thermal insecticidal fogging products are used, approved warning signs bearing the "skull and crossbones" emblem with the warning "DANGER! POISON GAS! KEEP OUT!" and notices pertaining to the type of chemicals being used shall be posted. The notices pertaining to the type of chemicals for fumigation and thermal insecticidal fogging shall be printed in red ink on a white background. Letters in the headlines shall be at least 2 inches (51 mm) in height and shall state the date and time of the operation, the name and address of the person, the name of the operator in charge, and a warning stating that the occupied premises shall be vacated at least 1 hour before the operation begins and shall not be reentered until the danger signs have been removed by the proper authorities.

1703.1.2 Storage warning signs. Where fumigants and thermal insecticidal fogging products are stored NFPA 704 placard guidelines shall be followed.

Replace Section 1703.3.1 as follows:

1703.3.1 Warning signs. Approved warning signs indicating the danger, type of chemical involved and necessary precautions shall be posted on all doors and entrances to the premises, including interior rooms and areas. Where

fumigants and thermal insecticidal fogging products are used, approved warning signs bearing the "skull and crossbones" emblem with the warning "DANGER! POISON GAS! KEEP OUT!" shall be posted. Such notices shall be printed in red ink on a white background. Letters in the headlines shall be at least two (2) inches (51 mm) in height and shall state the date and time of the operation, the name and address of the person, the name of the operator in charge, and a warning stating that the occupied premises shall be vacated at least one (1) hour before the operation begins and shall not be reentered until the danger signs have been removed by the proper authorities.

Add Section 1703.3.1.1 as follows:

1703.3.1.1 Storage warning signs. Where fumigants and thermal insecticidal fogging products are stored, NFPA 704 placard guidelines shall be followed.

CHAPTER 19
LUMBER YARDS AND WOODWORKING FACILITIES

SECTION 1904
FIRE PROTECTION

Replace Section 1904.2 as follows:

1904.2 Portable fire extinguishers and standpipes. Portable fire extinguishers or standpipes supplied from an approved water system shall be provided within 50 feet (15240 mm) of travel distance to any machine producing shavings or sawdust. Extinguishers shall be provided in accordance with IFC Section 906 for extra-high hazards.

SECTION 1909
EXTERIOR STORAGE OF FINISHED LUMBER PRODUCTS

Replace Section 1909.5 as follows:

1909.5 Fire protection. An approved hydrant and portable fire-extinguishing equipment suitable for the fire hazard involved shall be provided for open storage yards. Hydrant systems shall be installed in accordance with NFPA 24. Portable fire extinguishers complying with Section 906 shall be located so that the travel distance to the nearest unit does not exceed 75 feet (22860 mm). Portable fire extinguishers located in open storage yards shall be protected from weather and shall be maintained per NFPA 10. Portable fire extinguishers complying with IFC Section 906 and with a minimum rating of 4-A:40-B:C shall be provided on all vehicles operating in a lumber storage yard.

CHAPTER 20
MANUFACTURE OF ORGANIC COATINGS

SECTION 2005
PROCESS STRUCTURES

Replace Section 2005.5 as follows:

2005.5 Ventilation. Enclosed structures involving organic coating processes in which flammable or combustible liquids are processed or handled shall be mechanically ventilated at a continuous rate of not less than 1 cfm/ft2 [0.00508 m3/(s . m2)] of net floor area. Exhaust systems shall be designed in accordance with the International Mechanical Code. Exhaust system inlets shall be located in the area of origin and area of greatest concentration of contaminants. Make-up air shall be introduced in such a manner that all portions of the room or structure are provided with uniformly distributed air movement.

CHAPTER 21
INDUSTRIAL OVENS

SECTION 2103
LOCATION

Add Sections 2103.5, 2103.6 and 2103.7 as follows:

2103.5 Location. Ovens, oven heaters and related equipment shall be located with due regard to the possibility of fire resulting from overheating or the escape of fuel gas or fuel oil and the possibility of damage to the building and injury to persons resulting from explosion.

1. Ovens shall be located at or above grade.

   Exception:

   Ovens shall be permitted in basements where at least 50% of the wall area of the room in which the oven is located is above grade.

2. Ovens shall be located to be readily accessible for inspection and maintenance and with adequate clearances to permit the proper functioning of explosion vents.

2103.6 Relief (explosion) vents. Ovens which may contain flammable air-gas mixtures shall be equipped with relief vents for freely relieving internal explosion pressures.

2103.7 Ductwork. All ductwork shall be constructed of approved non-combustible material. Ducts shall be made tight throughout and shall have no openings other than those required for the proper operation and maintenance of the system. Ducts passing through combustible walls, ceilings, floors or roofs shall provide adequate insulation and clearances to prevent surface temperatures from exceeding 160 degrees F. Exhaust ducts shall not discharge within 10 feet of doors, windows or other air intakes in a manner that will permit re-entry of vapors into the building.

CHAPTER 22
MOTOR FUEL-DISPENSING FACILITIES AND REPAIR GARAGES

SECTION 2204
DISPENSING OPERATIONS

Replace Section 2204.3 as follows:

2204.3 Unattended self-service motor fuel-dispensing facilities. Unattended public self-service motor fuel-dispensing facilities are prohibited.

SECTION 2205
OPERATIONAL REQUIREMENTS

Add Section 2205.6.1 as follows:

2205.6.1 Lettering. Warning signs shall have the word “WARNING” in letters of not less than 1.5 inches in height and the remainder of the signs shall have letters of not less than one (1) inch in height on a background of contrasting color (but avoiding contrasts that are invisible to colorblind people).

SECTION 2211
REPAIR GARAGES

Replace Section 2211.4.3 as follows:

2211.4.3 Ventilation. Where Class I liquids or LP-gas are stored or used within a building having a basement or pit wherein flammable vapors could accumulate, the basement or pit shall be provided with mechanical ventilation in accordance with the *International Mechanical Code*, at a minimum rate of 1.5 cubic feet per minute per square foot (cfm/ft^2) [$0.008\ m^3/(s \cdot m^2)$] to prevent the accumulation of flammable vapors. The fan shall be configured in such a way that it runs continuously and the exhaust inlet is placed within 12" of the pit floor.

Add Sections 2211.4.4, 2211.4.5 and 2211.4.6 as follows:

2211.4.4 Fire protection systems. In buildings equipped with an automatic sprinkler system, pits and below-grade work areas shall be protected. Sprinkler systems in pits and below-grade work areas shall be separately zoned and the control valve shall be located outside the pit or below-grade work area.

2211.4.5 Flammable vapor monitoring. Pits and below-grade work areas shall be equipped with a flammable vapor-monitoring alarm. Alarm notification shall be local only and provided in an approved location(s).

2211.4.6 Warning sign(s). Pits and below grade work areas shall be identified as required. Doors or openings leading to a pit or below grade work area shall be plainly marked with the word OPEN PIT in red letters at least 6 inches high on a white background. Such warning signs shall be placed so as to be readily discernible.

CHAPTER 23
HIGH-PILED COMBUSTIBLE STORAGE

SECTION 2301
GENERAL

Replace Section 2301.1 Item #4 as follows:

4. Storage of combustible paper records shall be in accordance with NFPA 13, 230 and 232.

Add Section 2301.3 Item #15 as follows:

15. Submit Hazardous Material Inventory Statement (HMIS).

SECTION 2306
GENERAL FIRE PROTECTION AND LIFE SAFETY FEATURES

Replace Table 2306.2 in its entirety as follows:

TABLE 2306.2
GENERAL FIRE PROTECTION AND LIFE SAFETY REQUIREMENTS

COMMODITY CLASS	SIZE OF HIGH-PILED STORAGE AREA * (square feet) (see Sections 2306.2 and 2306.4)	ALL STORAGE AREAS (See Sections 2306, 2307, and 2308) [b]				SOLID-PILED STORAGE, SHELF STORAGE AND PALLETIZED STORAGE (See Section 2307.3)		
		Automatic fire-extinguishing system (see Section 2306.4)	Building Access (see Section 2306.6)	Smoke and heat removal (see Section 2306.7)	Draft curtains (see Section 2306.7)	Maximum pile dimension [c] (feet)	Maximum permissible storage height [d] (feet)	Maximum pile volume (cubic feet)
I-IV	0-500	Not Required [a]	Not Required [e]	Not Required	Not Required [k]	Not Required	Not Required	Not Required
	501-2,500	Not Required [a]	Not Required [e]	Not Required	Not Required [k]	100	40	100,000
	2,501-12,000	Yes	Not Required [e]	Not Required	Not Required [k]	100	40	400,000
	12,001-20,000	Yes	Yes	Yes [j]	Not Required [k]	100	40	400,000
	20,001-500,000	Yes	Yes	Yes [j]	Not Required [k]	100	40	400,000
	Greater than 500,000 [g]	Yes	Yes	Yes [j]	Not Required [k]	100	40	400,000
High hazard	0-500	Not Required [a]	Not Required [e]	Not Required	Not Required [k]	50	Not Required	Not Required
	501-2,500 Public accessible	Yes	Not Required [e]	Not Required	Not Required [k]	50	30	75,000
	501-2,500 Nonpublic accessible	Yes	Not Required [e]	Not Required	Not Required [k]	50	30	75000
	2,501-300,000	Yes	Yes	Yes	Not Required [k]	50	30	75,000
	300,001-500,000 [g, h]	Yes	Yes	Yes	Not Required [k]	50	30	75000

For SI: 1 foot = 304.8mm, 1 cubic foot = 0.02832m^3, 1 square foot = 0.0929m^2

a. When automatic sprinklers are required for reasons other than those in Chapter 23, the portion of the sprinkler system protecting the high-piled storage area shall be designed and installed in accordance with Sections 2307 and 2308.
b. For aisles, see Section 2306.9
c Piles shall be separated by aisled complying with Section 2306.9
d. For storage in excess of the height indicated, special fire protection shall be provided in accordance with note g when required by the fire code official. See also Chapters 28 and 34 for special limitations for aerosols and flammable and combustible liquids, respectively.
e. Section 503 shall apply for fire apparatus access.
f. Intentionally deleted.
g. Special fire protection provisions including, but not limited to, fire protection of exposed steel columns; increased sprinkler density; additional in rack sprinklers, without associated reductions in ceiling sprinkler density; or additional fire department hose connections shall be provided when required by the fire code official.
h. High-piled storage areas shall not exceed 500,000 square feet. A 2-hour fire wall constructed in accordance with the *International Building Code* shall be used to divide high-piled storage exceeding 500,000 square feet in area.
i. Intentionally deleted.
j. Not required when storage areas are protected by early suppression fast response (ESFR) sprinkler systems installed in accordance with NFPA 13.
k. For requirements refer to Section 910.3.5 and NFPA 13

Replace Section 2306.7 as follows:

2306.7 Smoke and heat removal. Where smoke and heat removal is required by Table 2306.2, smoke heat vents shall be provided in accordance with Table 910.3. Where draft curtains are required by IFC Section 903.3.1.1, they shall be provided in accordance with IFC Section 910.3.5.

SECTION 2308
RACK STORAGE

Replace Section 2308.4 as follows:

2308.4 Column protection. Steel building columns shall be protected in accordance with NFPA 13, 230 and 232.

SECTION 2310
SPECIALTY STORAGE

Replace Section 2310.1 General, as follows:

2310.1 General. Records storage facilities used for the rack or shelf storage of combustible paper records greater than 12 feet (3658 mm) in height shall be in accordance with IFC Sections 2306 and 2308 and NFPA 13, NFPA 230 and NFPA 232. Palletized storage of records shall be in accordance with IFC Section 2307. Any storage compartment exceeding 50,000 ft^3 will be considered at least a records center and must comply with NFPA 232 regardless of records classification.

Add Section 2311 Existing Buildings as follows:

SECTION 2311
EXISTING BUILDINGS

2311.1 Scope - Existing buildings constructed prior to October 1990. This section is applicable to high-piled or rack storage in existing buildings as follows:

1. Any modification to the existing commodities stored in an existing tenant space where storage height is increased or classification of the commodities is placed in a higher category per IFC 2303.
2. New tenant spaces in existing buildings.
3. Existing tenant spaces with new tenants.
4. In buildings that were built and occupied by a tenant with high-piled combustible stock prior to the adoption of the Uniform Codes on October 1, 1990; as long as that tenant remains in operation, it will be up to the Fire Department inspection to identify any unsafe conditions per IFC Section 110.

2311.2 Storage of Class I commodity – as defined by NFPA 13.

2311.2.1 Automatic sprinklers. Where an automatic sprinkler system is required by Table 2306.2, an approved automatic sprinkler system shall be provided in accordance with IFC Section 903.3.

Exception:

Existing automatic sprinkler system will be accepted, provided it is certified by a licensed Colorado professional engineer or a NICET Level III certified individual to provide a protection level equal to at least 70% design density of IFC Section 903.3.

2311.2.2 Building access. Building access from fire apparatus access roads in accordance with IFCA Section 503 shall be provided within 200 feet of all portions of the exterior walls of a building used for high-piled storage.

2311.2.2.1 Access doors. Fire Department access doors shall be provided in accordance with IFC Section 2306.6.1. Access doors shall be accessible without the use of a ladder. Roll-up doors shall not be used unless approved.

2311.2.3 Aisles. Shall be in accordance with IFC Sections 2306.9 or 903.3.1; the most restrictive shall govern.

2311.2.4 Portable fire extinguishers. Shall be in accordance with IFC Section 2306.10.

2311.3 Storage of Class II and III commodity - as defined by NFPA 13.

2311.3.1 Automatic sprinklers. Where an automatic sprinkler system is required by IFCA Table 2306.2, an approved automatic sprinkler system shall be provided in accordance with IFC Section 903.3.1.

Exception:

Existing automatic sprinkler system will be accepted, provided it is certified by a licensed Colorado professional engineer or a NICET Level III certified individual to provide a protection level equal to at least 70% design density of IFC Section 903.3.

2311.3.2 Building access. Building access from fire apparatus access roads in accordance with IFCA Section 503 shall be provided within 200 feet of all portions of the exterior walls of a building used for high-piled storage.

2311.3.2.1 Access doors. Fire Department access doors shall be provided in accordance with IFC Section 2306.6.1. Access doors shall be accessible without the use of a ladder. Roll-up doors shall not be used unless approved.

2311.3.3 Smoke and heat removal. Smoke and heat vents shall be provided in accordance with IFCA Section 2306.7 with a vent area to floor area ratio of 1:200. Draft curtains shall not be required when separation between high-piled storage and non high-piled storage is in accordance with IFC Section 2306.3 and not required per IFC Section 903.3.1.

Exceptions:

1. When the installation of smoke and heat vents is determined by the fire code official to be impractical, mechanical smoke- removal systems are allowed to be provided in accordance with IFC Section 910.4.
2. Frozen food storage classified as a Class II commodity is not required to be provided with smoke and heat vents or mechanical smoke removal when protected by an automatic sprinkler system.
3. Existing roof openings such as skylights may be used as smoke vents when approved by the fire code official.

2311.3.4 Aisles. Shall be in accordance with IFC Sections 2306.9 or 903.3.1; the most restrictive shall govern.

2311.3.5 Portable fire extinguishers. Shall be in accordance with IFC Section 2306.10.

2311.4 Storage of Class IV, high-hazards and plastics commodities - as defined by NFPA 13.

2311.4.1 Automatic sprinklers. Where an automatic sprinkler system is required by Table 2306.2, an approved automatic sprinkler system shall be provided in accordance with IFC Section 903.3.

2311.4.2 Building access. Building access from fire apparatus access roads in accordance with IFCA Section 503 shall be provided within 100 feet of all portions of the exterior walls of building used for high-piled storage.

2311.4.2.1 Access doors. Fire Department access doors shall be provided in accordance with IFC Section 2306.6.1. Access doors shall be accessible without the use of a ladder. Roll-up doors shall not be used unless approved.

2311.4.3 Smoke and heat removal. Smoke and heat vents shall be provided in accordance with IFCA Section 2306.7 with vent area to floor area ratio accordance with IFCA Table 910.3. Draft curtains shall not be required when separation between high-piled storage and non high-piled storage is in accordance with IFC Section 2306.3 and not required per IFC Section 903.3.1.

Exception:

When the installation of smoke and heat vents is determined by the fire code official to be impractical, mechanical smoke-removal systems are allowed to be provided in accordance with IFC Section 910.4.

2311.4.4 Aisles. Shall be in accordance with IFC Sections 2306.9 or 903.3.1; the most restrictive shall govern.

2311.4.5 Portable fire extinguishers. Shall be in accordance with IFC Section 2306.10.

Add Section 2312 Storage Rack Installation as follows:

SECTION 2312
STORAGE RACK INSTALLATION

2312 Storage rack installation. A building permit shall be required for all high-piled storage rack system installations.

1. Drawings must be submitted to the Denver Fire Department for review prior to the issuance of a permit, showing:
   a. Scaled plans.
   b. The rack arrangement in the warehouse area with sufficient detail to allow an exiting analysis per IBC Chapter 10.
   c. A typical section view showing the height of the racks.
   d. Completed Hazards Material Inventory Statement (HMIS) and height of all commodities.
2. Indicate the location of any required smoke and heat vents and draft curtains in relation to the rack locations.
3. Structural analysis per IBC Chapters 16 and 22 will be required on rack systems. Installation and application shall be in accordance with the rack manufacturers' recommendations..

CHAPTER 24
TENTS, CANOPIES AND OTHER MEMBRANE STRUCTURES

SECTION 2403
TEMPORARY TENTS, CANOPIES AND MEMBRANE STRUCTURES

Replace Section 2403.2 as follows:

2403.2 Approval required. Tents and membrane structures having an area in excess of 200 square feet and canopies in excess of 300 square feet shall not be erected, operated, or maintained for any purpose without first obtaining a permit and approval from the fire code official.

Exception:

Tents used exclusively for recreational camping purposes.

SECTION 2404
TEMPORARY AND PERMANENT TENTS, CANOPIES AND MEMBRANE STRUCTURES

Replace Section 2404.20 as follows:

2404.20 Standby personnel. When, in the opinion of the fire code official, it is essential for public safety in a tent, canopy, or membrane structure used as a place of assembly or any other use where people congregate, or any building premise or property where people congregate, because of the number of persons, or the nature of the performance, exhibition, display, contest, or activity, or when potentially hazardous conditions exist, or an occupant load varies due to large crowd movement from one building to another building or one area of a building to another area of the building, or there is a reduction in a life safety feature, or there is an impairment to a fire protection feature, the owner, agency, or lessee shall employ and compensate through Department of Safety channels, at a rate established by the Manager of Safety, one or more firefighters of the City and County of Denver, as required by the fire code official. Such firefighter(s) shall be subject to the fire code official’s orders at all times when so employed and shall be in uniform and remain on duty during the times such places are open to the public or when such activity is being conducted or, in the case of residential occupancies, whenever occupied.

CHAPTER 25
TIRE REBUILDING AND TIRE STORAGE

SECTION 2505
OUTDOOR STORAGE

Amend Section 2505.4 by adding Exception as follows:

Exception:

Outside storage shall be limited to 5,000 square feet of tire storage. Storage in excess of 5,000 square feet (464.5 square meters) does not meet this exception. Tire storage piles shall be located at least 10 feet from lot lines and buildings if storage is no higher than 6 feet. Storage heights from 6 feet to 10 feet shall be no closer to lot lines and buildings than 20 feet.

SECTION 2508
FIRE PROTECTION

Add Section 2508.3 as follows:

2508.3 Automatic sprinkler systems. Automatic sprinkler systems shall be installed in accordance with Section 903.2.8.2.

CHAPTER 26
WELDING AND OTHER HOT WORK

SECTION 2601
GENERAL

Add Item #6 to Section 2601.3 as follows:

6. Areas where uncleaned or improperly prepared drums, tanks, or other containers and equipment that have previously contained materials that could develop explosive atmospheres.

SECTION 2605
GAS WELDING AND CUTTING

Replace Section 2605.2 as follows:

2605.2 Cylinder and container storage, handling and use. Storage, handling and use of compressed gas cylinders, containers and tanks shall be in accordance with this section and Chapter 30. Ordinary rope slings or electromagnets shall not be used as defined and described in Section 3005.10 of this code.

SECTION 2608

ACETYLENE GENERATORS

Replace Section 2608.1 as follows:

2608.1 Use of acetylene generators. The use of acetylene generators shall comply with this section and NFPA 51 and 51A.

CHAPTER 27
HAZARDOUS MATERIALS—GENERAL PROVISIONS

SECTION 2701
GENERAL

Replace 2701.1, Exception 1 as follows:

1. The quantities of alcoholic beverages, medicines, foodstuffs, and cosmetics containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable, in mercantile occupancies, are unlimited when packaged in individual containers not exceeding 1.3 gallons (5 L).

Replace Section 2701.3 as follows:

2701.3 Performance-based design alternative. When approved by the fire code official, buildings and facilities where hazardous materials are stored, used or handled shall be permitted to comply with this section as an alternative to compliance with the other requirements set forth in this chapter and Chapters 28 through 44. Written approval shall be obtained from the fire code official prior to submitting a performance-based design.

Replace Section 2701.5.2, Item #5 as follows:

5. Chemical Abstract Service (CAS) identification number required. United Nations (UN) and North America (NA) identification numbers may be provided as additional information.

Add Section 2701.7 as follows:

2701.7 Laboratories using chemicals. Laboratory buildings, laboratory units, and laboratory work areas in which chemicals are handled or stored shall be in accordance with NFPA 45 and this code.

SECTION 2702
DEFINITIONS

Add the following definitions to Section 2702.1:

BIOHAZARD. An infectious agent or hazardous biological material that presents a risk or potential risk to the health of humans, animals or the environment. The risk can be direct through infection or indirect through damage to the environment. Biohazardous materials include certain types of recombinant DNA; organisms and viruses infectious to humans, animals or plants (e.g. parasites, viruses, bacteria, fungi, prions, rickettsia); and biologically active agents (i.e. toxins, allergens, venoms) that may cause disease in other living organisms or cause significant impact or the environment or community.

CARCINOGEN. A substance that causes the development of cancerous growths in living tissue. A chemical is considered to be a carcinogen if:

1. It has been evaluated by the International Agency for Research on Cancer (IARC) and found to be a carcinogen or potential carcinogen, or
2. It is listed as a carcinogen or potential carcinogen in the latest edition of the Annual Report on Carcinogens published by the National Toxicology Program, or
3. It is regulated by OSHA as a carcinogen.

OTHER HEALTH HAZARD MATERIAL. A hazardous material which affects target organs of the body, including but not limited to, those materials which produce liver damage, kidney damage, damage to the nervous system, act on the blood to decrease hemoglobin function, deprive the body tissue of oxygen, or affect reproductive capabilities, including mutations (chromosomal damage) or teratogens (effects on fetuses).

RADIOACTIVE MATERIAL. Any material or combination of materials that spontaneously emits ionizing radiation.

RELEASE/UNAUTHORIZED DISCHARGE. Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discharging of barrels, containers, and other receptacles containing any hazardous substances or pollutant or contaminant).

SENSITIZER. A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

SECTION 2703
GENERAL REQUIREMENTS

Replace Table 2703.1.1(1) Footnote c as follows:

c. The quantities of alcoholic beverages in mercantile occupancies shall not be limited providing the liquids are packaged in individual containers not exceeding 1.3 gallons. In mercantile occupancies the quantities of medicines, foodstuffs and cosmetics containing not more than 50 percent by volume of water-miscible liquids with the remainder of the solution not being flammable shall not be limited, provided that such materials are packaged in individual containers not exceeding 1.3 gallons.

Replace Table 2703.1.1(2) Footnote b as follows:

b. In mercantile occupancies the quantities of medicines, foodstuffs and cosmetics containing not more than 50 percent by volume of water-miscible liquids with the remainder of the solution not being flammable shall not be limited, provided that such materials are packaged in individual containers not exceeding 1.3 gallons.

Replace Section 2703.4 as follows:

2703.4 Material Safety Data Sheets. Material Safety Data Sheets (MSDS) shall be readily available on the premises (*hard copy shall always be required*) for hazardous materials regulated by this chapter. Material Safety Data Sheets shall be located at the main entrance or a location approved by the Fire Department. When a hazardous substance is developed in a laboratory, available information shall be documented and maintained at a Fire Department approved location. The Denver Fire Department serves as the reporting agency for the City and County of Denver, the authority having jurisdiction (AHJ).

Add Section 2703.5.2 as follows:

2703.5.2 Confined spaces. Tanks that contain materials that would not contain enough oxygen to support life shall have a confined space sign at the entrance to the tank.

SECTION 2704
STORAGE

Replace Section 2704.9 as follows:

2704.9 Emergency alarm. An approved manual emergency alarm system shall be provided in buildings, rooms or areas used for storage of hazardous materials. Emergency alarm-initiating devices shall be installed in an approved location adjacent to each interior exit or exit access door of storage buildings, rooms or areas. Activation of an emergency alarm-initiating device shall sound a local alarm to alert occupants of an emergency situation involving hazardous materials. The Denver Fire Department, based on the specific hazards associated with materials being stored, shall determine the type of alarm, including the location and type of alarm-initiating devices and notification appliances. The emergency alarm for hazardous materials shall be connected to the fire alarm system and shall be annunciated as a separate zone(s) in accordance with IFCA Section 907.2.5.1. System components (equipment) shall be listed for the worst-case weather and temperature ranges to which the equipment will be exposed.

Replace Section 2704.10 as follows:

2704.10 Supervision. Emergency alarm, detection and automatic fire-extinguishing systems required by Section 2704 shall be supervised by an approved Class I central station service.

Replace Section 2704.12 as follows:

2704.12 Noncombustible floor. Except for surfacing, floors, walkways, ramps, structures for walkways and ramps of storage areas shall be of noncombustible construction.

SECTION 2705
USE, DISPENSING AND HANDLING

Replace Section 2705.1.2 as follows:

2705.1.2 Noncombustible floor. Except for surfacing, floors, walkways, ramps, structures for walkways and ramps of areas where liquid or solid hazardous materials are dispensed or used in open systems shall be of noncombustible, liquid-tight construction.

Replace Section 2705.2.1.1 as follows:

2705.2.1.1 Ventilation. Where gases, liquids or solids having a hazard ranking of 3 or 4 in accordance with NFPA 704 are dispensed or used, mechanical exhaust ventilation shall be provided to capture fumes, mists or vapors at the point of generation. Use as a reference for capture velocity the American Association of Industrial Hygienists (AAICH) handbook, Volume 25.

Exception: Gases, liquids or solids which can be demonstrated not to create harmful fumes, mists or vapors.

CHAPTER 33
EXPLOSIVES AND FIREWORKS

SECTION 3301
GENERAL

Delete all Exceptions to Section 3301.1.

Delete Exceptions 1, 2, and 4 to Section 3301.1.3.

Replace Section 3301.2.4 as follows:

3301.2.4 Financial responsibility. Before a permit is issued, as required by Section 3301.2, the applicant shall file with the Fire Prevention and Investigation Division a surety bond in the principal sum of $2,000,000 or a public liability insurance policy for the same amount, for the purpose of the payment of all damages to persons or property which arise from, or are caused by, the conduct of any act authorized by the permit upon which any judicial judgment results. The fire code official is authorized to specify a greater or lesser amount when, in his or her opinion, conditions at the location of use indicate a greater or lesser amount is required. Government entities shall be exempt form this bond requirement.

Replace Section 3301.4 as follows:

3301.4 Qualifications. Persons in charge of magazines, blasting, fireworks display, or pyrotechnic special effect operations shall obtain the appropriate State of Colorado and City and County of Denver Fire Department license. For pyrotechnic special effect operations, the license is that required for an outdoor display operator. Persons in charge of magazines, blasting, fireworks display, or pyrotechnic special effect operations shall not be under the influence of alcohol or drugs which impair sensory or motor skills, shall be at least 21 years of age, and shall demonstrate knowledge of all safety precautions related to the storage, handling, or use of explosive, explosive material, or fireworks.

Replace Section 3301.5 as follows:

3301.5 Supervision The fire code official is authorized to require operations permitted under the provisions of Section 3301.2 to be supervised at any time by the fire code official in order to determine compliance with all safety and fire regulations. The Denver Fire Department Fire Prevention pyrotechnics personnel shall be retained for fire watch and to inspect all equipment and powder charges. The pyrotechnics firm to which the permit is issued/granted shall be responsible for the cost of this/these personnel.

SECTION 3306
SMALL ARMS AMMUNITION

Add Section 3306.4.3 as follows:

3306.4.3 Small arms cartridges. No more than 10,000 small arms cartridges shall be stored in any Group R occupancy.

CHAPTER 34
FLAMMABLE AND COMBUSTIBLE LIQUIDS

SECTION 3401
GENERAL

Replace Section 3401.2, Item #2 as follows:

3401.2 Nonapplicability

2. Unlimited quantities of:

   a. Alcoholic beverages, medicines, foodstuffs and cosmetics containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solution not being flammable, in mercantile occupancies, when packaged in individual containers not exceeding 1.3 gallons (5 liters).

   b. Consumer or industrial products with a closed cup flash point at or above 200 degrees F (93C) in mercantile occupancies when packaged in individual containers not exceeding 1.3 gallons (5 liters).

Add Section 3401.5.1 as follows:

3401.5.1 Altitude correction. Altitude has a direct impact on the physical properties of flammable and combustible liquids and shall be accounted in the design considerations of life safety and property protection systems. Flash point and boiling point information for flammable and combustible liquids is referenced to sea level. In Denver, Colorado, the flash point and boiling point of flammable and combustible liquids will reduce by 8°F and may cause reclassification of flammable and combustible liquids.

SECTION 3404
STORAGE

Delete Section 3404.3.8.5.

Replace exception to Section 3404.4.3 as follows:

Exception:

Containers stored on approved containment pallets in accordance with Section 2704.2.3 and containers stored in cabinets and lockers with integral spill containment. Liquids classified as a combustible Class III-B shall not be required to have secondary containment.

SECTION 3406
SPECIAL OPERATIONS

Replace Section 3406.2.5 as follows:

3406.2.5 Type of tank. Tanks shall be provided with top opernings only. Dispensing by use of gravity is prohibited.

Replace Section 3406.2.5.2 as follows:

3406.2.5.2 Tanks for gravity discharge. Dispensing by use of gravity is prohibited.

CHAPTER 36
FLAMMABLE SOLIDS

SECTION 3602
DEFINITIONS

3602.1 Definitions. Replace the definition of 'FLAMMABLE SOLID' as follows:

FLAMMABLE SOLID. A solid, other than a blasting agent or explosive, capable of causing fire through friction, absorption or moisture, spontaneous chemical change, or retain heat from manufacturing or processing, or which has an ignition temperature below 212 degrees F (100 degrees C) or which burns so vigorously and persistently when ignited as to create serious hazard. A chemical shall be considered a flammable solid as determined in accordance with the test method of CPSC 16 CFR:Part 1500.44, if it ignites and burns with self-sustained flame at a rate greater than 0.1 inch (2.5mm) per second along its major axis. Flammable solids include finely divided solid materials which, when dispersed in air as a cloud, could be ignited and cause an explosion.

CHAPTER 37
HIGHLY TOXIC AND TOXIC MATERIALS

SECTION 3703
HIGHLY TOXIC AND TOXIC SOLIDS AND LIQUIDS

Replace Section 3703.1.2 as follows:

3703.1.2 Quantities exceeding the maximum allowable quantity per control area. The indoor storage or use of highly toxic and toxic solids or liquids in amounts exceeding the maximum allowable quantity per control area set forth in Table 2703.1.1(2) shall be in accordance with IFC Sections 3701 through 3703.1.5 and Chapter 27.

CHAPTER 38
LIQUEFIED PETROLEUM GASES

SECTION 3803
INSTALLATION OF EQUIPMENT

Add the following to the end of Section 3803.2.1.7:

Such containers shall not exceed a water capacity of 2.5 lbs.

Add the following to the end of Section 3803.3:

Not allowed for permanent use if within 300 feet of a natural gas source.

SECTION 3804
LOCATION OF CONTAINERS

Add Exceptions 2 and 3 to Section 3804.2 as follows:

Exception:

1. For single-family dwellings, a maximum of 40 pounds of propane [or two (2) 20-lb. cylinders—one for use and one spare bottle] shall be permitted on the premises. For quantity limits inside the actual dwelling unit, see NFPA 58, Chapter 5, Section 3.4.
2. For multi-family dwellings, one (1) 20-lb. propane cylinder is allowed to be stored in each detached garage or storage area.

SECTION 3809
STORAGE OF PORTABLE LP GAS CONTAINERS AWAITING USE OR RESALE

Replace Section 3809.6 as follows:

3809.6 Storage on roofs. LP-gas storage on roofs is not permitted.

CHAPTER 40
OXIDIZERS

SECTION 4003
GENERAL REQUIREMENTS

Replace Section 4003.1.1.3 as follows:

4003.1.1.3 Oxidizing gases. Except for cylinders not exceeding a capacity of 250 cubic feet/ 7m3, (one in use and one in storage) each used for maintenance purposes, patient care or operation of equipment, oxidizing gases shall not be stored or used in Group A, B, E, I or R occupancies. For each individual dwelling unit in R occupancies, the maximum quantity of an oxidizing gas shall be less than 504 cubic feet/14 m3 – which is less than the permittable amount per Section 105.6. The aggregate quantities of gases used for maintenance purposes and operation of equipment shall not exceed the maximum allowable quantity per control area listed in Table 2703.1.1(1). Medical gas systems and medical gas supply cylinders shall also be in accordance with Sections 3003 and 3006. The use of an open flame or smoking within a residential unit where compressed gas is used is prohibited.

CHAPTER 45

REFERENCED STANDARDS

Replace the specific NFPA Standards listed in Chapter 45 with the following:

NFPA	National Fire Protection Association Battery March Park Quincy, MA 02269 NFPA Codes and Standards—2007 Edition Volumes 1 through 15

Addition: Reference the following standard:

National Chlorine Institute	Chlorine Manual 6th printing—2000
NFPA 70	2005 National Electrical Code

Addition: Reference the following standard:

Institute of Makers of Explosives	Institute of Makers of Explosives 1575 I Street N.W., Suite #550 Washington, D.C. 20005

Addition: Reference the following standards:

Pamphlet 1	Construction Guide for Storage Magazines - 2006
Pamphlet 3	Suggested Code Regulations - 2003
Pamphlet 14	Handbook for the Transportation and Distribution of Explosive Materials - 2007
Pamphlet 17	Safety in the Transportation, Storage, Handling and Use of Explosives - 2007
Pamphlet 20	Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Electric Blasting Caps - 2001
Pamphlet 21	Destruction of Commercial Explosives
Pamphlet 22 (b)	IME Standard for the Safe Transportation of Class C Detonators (Blasting Caps) in a Vehicle with Certain Other Explosives (1995)
Pamphlet 23	Recommendations for the Transportation of Explosives, Division 1.5, Ammonium Nitrate, Emulsion, Division 5.1, Combustible Liquids, Class 3, and Corrosives, Class 8 in Bulk Packaging - 2007
ANSI/ASHRAE 15	Safety for Refrigeration Systems – 2004
ASME B31	Standard for Pressure Piping

Deletion: IEC International Electrical Code

APPENDICES

APPENDIX ADOPTION STATUS

IFC APPENDICES
STATUS OF APPENDICES ON ADOPTION

All Chapters and Sections of this Appendix are adopted as part of this Code except for those that are deleted in this summary. Those that are amended or added shall also be adopted as part of this Code.

APPENDIX	TITLE	STATUS
A	Board of Appeals	Delete
B	Fire-Flow Requirements for Buildings	Adopt As Amended
C	Fire Hydrants Locations and Distribution	Adopt As Amended
D	Fire Apparatus Access Road	Delete
E	Hazard Categories	Adopt/As Reference
F	Hazard Categories	Adopt
G	Cryogenic Fluids-Weight and Volume Equivalents	Adopt/As Reference

APPENDIX B

FIRE-FLOW REQUIREMENTS FOR BUILDINGS

SECTION B104
FIRE-FLOW CALCULATION AREA

Replace Section B104.1 as follows:

B104.1 General. The fire-flow calculation area shall be the total area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in Section B104.3. In buildings with mixed construction types as defined in IBC, the fire-flow calculations shall follow the method described in the *2006 International Fire Code Commentary.*

SECTION B105
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

Replace B105.2 with the following:

B 105.2 Buildings other than one- and two-family dwellings. The minimum fire flow and flow duration for buildings other than one- and two-family dwellings shall be as specified in Table B105.1.

Exception:

A reduction in required fire flow of up to 50 percent, as approved, is allowed when the building is protected throughout with an automatic fire sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler System,* or NFPA 13R, *Sprinkler Systems in Residential Occupancies Up To and Including Four Stories in Height.* The resulting fire flow shall not be less than 1,500 gallons per minute (5,678 L/min) for the prescribed duration as specified in Table B 105.1. Any existing hydrant shall flow no less than 1,500 gpm with a minimum residual pressure of 20 psi.

Delete Footnote a in Table B105.1.

APPENDIX C

FIRE HYDRANT LOCATIONS AND DISTRIBUTION

Add Section C106 as follows:

SECTION C106
WATER MAINS SERVING FIRE HYDRANTS

Add Section C106 as follows:

C106.1 Water mains serving fire hydrants. Water mains supplying fire hydrants, fire protection systems, and building fire flows shall be sized to provide fire flows for required fire hydrants. Water mains supplying fire hydrants shall be looped as required by the Denver Water Department Operating Rules Section 8.03 unless specifically approved by the Denver Water Department.

APPENDIX E
HAZARD CATEGORIES

Adopt Appendix E as reference.

APPENDIX F
HAZARD RANKING

Adopt Appendix F as code.

APPENDIX G
CRYOGENIC FLUIDS—WEIGHT AND VOLUME EQUIVALENTS

Adopt Appendix G as reference.

AMENDMENTS TO THE 2006 EDITION OF THE INTERNATIONAL RESIDENTIAL CODE AND APPENDICES AS PUBLISHED BY INTERNATIONAL CODE COUNCIL (ICC)

The content of the sections in this Code that begin with a letter or letters designations are maintained by other City or State entities.

[B]	**Denotes International Building Code**
[P]	**International Plumbing Code**
[R]	**International Residential Code**
[EB]	**Existing Building**
[CRS]	**Colorado Revised Statute**
[PW]	**Public Works/Wastewater Management**

CHAPTER 1
ADMINISTRATION

SECTION R101
TITLE, SCOPE AND PURPOSE

Section R101.1 is amended by deletion and replacement with the following

R101.1 Title. These provisions shall be known as the Residential Code for One and Two-Family Dwellings of the City and County of Denver, and shall be cited as such and will be referred to herein as "this Code".

R101.2 Scope. The provisions of the *International Residential Code for One and Two-family Dwellings* shall apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, removal and demolition of detached one and two-family dwellings and townhouses not more than three stories above grade in height with a separate means of egress and their accessory structures.

That section R102.4 of the Denver Amendments to the 2006 International Residential Code, adopted as part of the Denver Building Code is hereby amended by adding and enacting subsection R102.4.1 to read and be read as follows:

R102.4.1. Chapter 33 "Safeguards During Construction" of the IBC and the Denver Amendments thereto shall apply to all work regulated by the IRC.

Sections R103 through R114 are amended by deleting those sections in their entirety. The "Administration of the 2007 Denver Building Code" provisions shall govern.

CHAPTER 3
BUILDING PLANNING

SECTION R301
DESIGN CRITERIA

Table R301.2(1) is amended as follows:

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD	WIND[1] SPEED (MPH)	SEISMIC DESIGN CATEGORY	SUBJECT TO DAMAGE FROM				WINTER DESIGN TEMP	ICE SHIELD UNDER-LAYMENT REQUIRED	FLOOD HAZARDS	AIR FREEZING INDEX	MEAN ANNUAL TEMP
			Weathering	Frost line depth	Termite	Decay					
25 psf	90/100	B	Severe	36	Slight/Mod	None/ Slight	1°	No	1978	712	40-45

*1. Wind Speed: See IBCA Section 1609 For Additional Information.

Section R302.1 is amended by adding Exception 4.

Exception:

4. Where the zoning ordinance establishes a minimum ten feet clear separation distance between the exterior walls of adjacent one and two family dwellings located on separated properties and allows one building to be closer to actual property line than the other, the imaginary line provision of IBC Section 704.3 may be used. The exterior wall shall not be located less than three feet to the actual property line.

   The location of the assumed imaginary line with relation to both buildings shall be such that the exterior wall, openings, projections and penetrations meet the criteria set forth in Section R302.1 and Table 302.1.

SECTION R305
CEILING HEIGHT

[EB] Section R305.1 Exception 2 is amended by adding the following to the last sentence.

Ceiling height in unfinished basements built prior to October 1990 shall be a minimum ceiling height of 6' 8" with a minimum clearance of 6' 0" to any ceiling projection caused by beams, ducts or pipes. If unusual circumstances are present, ceiling heights lower than 6' 8" are subject to the approval of the Building Official.

[CRS] SECTION R322
ACCESSIBILITY

Section R322.1 is amended by adding the following sentence:

In addition to the requirements of this section, the provisions of the Colorado Revised Statute 9-5 shall be applicable. CRS 9-5 is reproduced in Appendix M of the Denver Amendments to the IBC.

CHAPTER 4
FOUNDATIONS

SECTION R401
GENERAL

[PW] Section R401.1 is amended by adding the following sentence:

Wastewater Management Division of Public Works regulates the requirements for excavation, grading and earthwork construction, including fills and embankments.

Section R401.4 is amended by deleting in its entirety and replacing with the following:

R401.4 Soil tests. The classification of the soil at each building site shall be determined when required by the Building Official. The Building Official may require that this determination be made by an engineer or architect licensed by the state to practice as such.

R401.4.1 Investigation. The classification shall be based on observation and any necessary tests of the materials disclosed by borings or excavations made in appropriate locations. Additional studies may be necessary to evaluate soil strength, the effect of moisture variation on soil bearing capacity, compressibility, liquefaction, and expansiveness.

R401.4.2 Reports. The soil classification and design bearing capacity shall be shown on the plans, unless the foundation conforms to Table R403.1. The Building Official may require submission of a written report of the investigation, which shall include, but need not be limited to the following information:

1. A plot showing the location of the test borings and/or excavations.
2. Description and classifications of the materials encountered.
3. Elevation of the water table, if encountered.
4. Recommendations for foundation type and design criteria, including bearing capacity, provisions to mitigate the effects of expansive soils, provisions to mitigate the effects of liquefaction and soil strength, and the effects of adjacent loads.
5. Expected total and differential settlement.

CHAPTER 9
ROOF ASSEMBLIES

SECTION R903
WEATHER PROTECTION

Section R903.2.2 is added.

R903.2.2 Flashing for Single-ply roof systems. All flashing installations for single-ply roofing systems shall be installed per manufacturer's latest recommendations and details for the system.

Section R903.2.3 is added.

R903.2.3 Flashing for interior roof drains. Flashing for interior roof drains shall be one of the following:

1. A minimum of 2 x 2 feet, 4-pound lead sheet or lead-copper coated sheet, set on completed felts in flashing cement.
2. The metal shall be turned a minimum of ½ inch into a drain sump and plied with 2 plies of Type 4 felt or modified bitumen membrane of sufficient dimension to extend a minimum of 6 inches past metal sheet.
3. A 2-component drain system. The membrane flashing shall be polyvinylchloride sheet measuring 22 inches in length and factory-attached to the underside of the strainer flange. The membrane flashing shall be applied on top of the completed felt, shall extend a minimum of 6 inches from the outside diameter of the drain throat, shall be set into hot asphalt or approved sealants and plied in with 2 plies of Type 4 felt.
4. Drain details for single-ply systems shall be installed per manufacturers' specifications.

Section R903.2.4 is added.

R903.2.5.1 Equipment on roof. Equipment placed over roofing shall be supported by 8 inch legs or pads, which shall not inhibit the flow of water from the roof.

Section R903.4.5 is added.

R903.4.5 Vertical Projections. All projections through the roof surface shall be properly flashed to prevent moisture entry.

1. Pipe penetrations shall be completed with a standard roof jack or manufacturer-recommended detail.
2. Pitch pans may be used to flash multiple penetrations with prior approval. Chem-curb, pourable sealer or sheet metal caps shall be used to seal pitch pans.

SECTION R905
REQUIREMENTS FOR ROOF COVERINGS

R905.2 ASPHALT SHINGLES

R905.2.7 is amended by adding exception.

Exception:

An accepted self-adhering polymer modified bitumer sheet can substitute for a double underlayment installation.

R905.2.8.2 item 3 is amended by adding the following:

3. Metal valley liners shall not be allowed in closed valleys.

Section R905.3 is added.

R905.3 CLAY AND CONCRETE TILE

R905.3 Inspection of tile roofs. Mid-roof inspections shall be made to inspect battens and flashings. No more than 30% of the roofing shall be completed when requesting the inspection.

R905.5 MINERAL-SURFACED ROLL ROOFING

Section R905.5.2 is deleted and replaced by the following:

R905.5.2 Deck Slope. Mineral surfaced rolled roofing (90 lbs.) shall not be applied on roof slopes below two units vertical in twelve units horizontal.

Exception:

Detached garages, patios and carports open on three sides may have a slope of one unit vertical in twelve units horizontal.

R905.9 BUILTUP ROOFS

Section R905.9.4 is added.

R905.9.4 Flashing – new built-up roof covering. Flashing shall be installed on all vertical walls and curbs in accordance with the manufacturers' specifications and:

1. All old wall flashing shall be removed prior to installation of new flashing.
2. All flashings shall extend at least 8 inches, but not more than 12 inches, up all vertical surfaces and at least 4 inches from base of cant.
3. The top edges of the flashing shall be fastened at 3-inch intervals and sealed with plastic cement.
4. End laps shall be at least 3 inches long, and covered with 4 inches of mesh embedded in plastic cement.
5. All vertical walls and projections shall be counterflashed with a 2-piece metal system installed watertight.
6. Nailer strips shall be provided on vertical walls, drips in edge and curbs which will not accept conventional nailing.

CHAPTER 11

ENERGY EFFICIENCY

SECTION N1101
GENERAL

Section N1101.2 Compliance is amended by adding the following items:

The results from a code compliant software program can be utilized to show compliance "REScheck™" – Residential Energy Code Compliance Software is one program currently being accepted. This program developed by the Department of Energy can be downloaded for free at http://www/energycodes.gov/compliance_tools.stm.

CHAPTER 26

GENERAL PLUMBING REQUIREMENTS

SECTION P2602
INDIVIDUAL WATER SUPPLY AND SEWAGE DISPOSAL

Section P2602 is amended by adding:

P2602.3 Existing buildings. Plumbing in existing buildings may have their use continued, if such use was legal at the time of enforcement of the Plumbing Code in force at the time of construction and such use is not detrimental to the health and safety requirements of the current use or occupancy.

Any change in the use or occupancy of any existing building or structure shall comply with the provisions of this Code. Deviations may be approved by the building official if they are determined to not be detrimental to the health and safety requirements.

SECTION P2604
TRENCHING AND BACKFILLING

Section P2604.5 Trench safety is amended by adding:

P2604.5 Trench safety. All excavations shall follow OSHA guidelines and/or requirements of this Code. The most restrictive rules shall apply.

IRC APPENDICES
STATUS OF APPENDICES ON ADOPTION

All Chapters and Sections of this Appendix are adopted as part of this Code except for those that are deleted in this summary. Those that are amended or added shall also be adopted as part of this Code.

APPENDIX	TITLE - SUBJECT	STATUS
A	Sizing and Capacity of Gas Piping (1FGS)	Informative
B	Sizing of Venting Systems Serving Appliances (IFGS)	Informative
C	Exit Terminals of Mechanical Draft and Direct-Vent Ventilating Systems (IFGS)	Informative
D	Recommended Procedures for Safety Inspection of an Existing Appliance Installation (IFGS)	Informative
E	Manufactured Housing Used as Dwellings (IBC)	Amended
F	Radon Control Methods	Deleted
G	Swimming Pools, Spas and Hot Tubs	Amended
H	Patio Covers	Adopted
I	Private Sewage Disposal	Deleted
J	Existing Buildings and Structures	Deleted
K	Sound Transmission	Adopted
L	IRC Electrical Provisions / NEC Cross Reference	Cross Reference

APPENDIX E
MANUFACTURED HOUSING USED AS DWELLINGS

SECTION AE101
SCOPE

Appendix E is amended in its entirety.

Manufactured housing used as dwellings shall comply with Section 3110 IBC Amendment.

DENVER AMENDMENTS TO THE 2006 EDITION OF THE INTERNATIONAL MECHANICAL CODE AND APPENDICES AS PUBLISHED BY INTERNATIONAL CODE COUNCIL (ICC)

The content of the sections in this Code that begin with a letter or letters designations are maintained by other City or State entities.

[F]	**Denotes International Fire Code**
[IFCA]	**Denver Fire Code Amendments to the IFC**

CHAPTER 1
ADMINISTRATION

SECTION 101
GENERAL

Section 101.1 Title. Is amended by inserting "City and County of Denver" for the name of the jurisdiction.

Section 103 through 106, 108 and 109 are amended by deleting those sections in their entirety. The "Administration of the 2007 Denver Building" provisions shal govern.

CHAPTER 4
VENTILATION

SECTION 403
REQUIRED OUTDOOR VENTILATION AIR

Section 403 is amended by adding Section 403.4:

The ventilation rates indicated by Table 403.3 may be reduced for spaces with intermittent or variable occupancy in accordance with ASHRAE 62-1999, Section 6.1.3.4.

SECTION 404
ENCLOSED PARKING GARAGES

Section 404.1 is amended by adding Section 404.1.1 as follows:

404.1.1 Where the system is arranged to operate automatically upon detection of a concentration of carbon monoxide, the limit shall be set at 25 parts per million (ppm).

CHAPTER 5
EXHAUST SYSTEMS

SECTION 507
COMMERCIAL KITCHEN HOODS

Section 507.2.1.1 Operation is deleted in its entirety.

SECTION 513
SMOKE CONTROL SYSTEMS

Section 513 is amended by adding the following sentence: All sections that begin with the letter [F] designation shall be coordinated with Section 909 of the IFC and IFCA.

IMC APPENDICES
STATUS OF APPENDICES ON ADOPTION

Appendix A is Adopted

Appendix B is deleted.

DENVER AMENDMENTS TO THE 2006 EDITION OF THE INTERNATIONAL PLUMBING CODE AND APPENDICES AS PUBLISHED BY THE INTERNATIONAL CODE COUNCIL (ICC)

The content of the sections in this Code that begin with a letter or letters designations are maintained by other City or State entities.

[PW]	**Denotes Public Works**
[EB]	**Existing Buildings**
[CC]	**City Council**
[EH]	**Environmental Health**
[CPB]	**Colorado Plumbing Board**
[DW]	**Denver Water**
[FCWA]	**Federal Clean Water Act**

CHAPTER 1
ADMINISTRATION

SECTION 101
GENERAL

Amend Section 101.1 Title. By inserting "City and County of Denver" for the name of the jurisdiction.

Section 101.2.1 is amended by adding section:

101.2.1 Swimming pools, spas and hot tubs.

The International Codes shall be used in the design of all swimming pools, spas and hot tubs. In those instances where the International Codes have no reference to items specific to the design of swimming pools, spas, and hot tubs, the 2006 Uniform Swimming Pool, Spa, and Hot Tub code shall be used.

IPC Sections 103 through 106, 108 and 109 are amended by deleting these sections in their entirety. The "Administration of the 2007 Denver Building Code" provisions shall govern.

CHAPTER 3
GENERAL REGULATIONS

SECTION 301
GENERAL

[EB] Section 301 is amended by adding sections:

301.8 Existing buildings. Plumbing in existing buildings may have their use continued, if such use was legal at the time of enforcement of the Plumbing Code in force at the time of construction and such use is not detrimental to the health or safety requirements of current occupancy or use.

Any change in the use or occupancy of any existing building or structure shall comply with the provisions of the IPC. Any deviations may be approved by the Building Official if they are determined to not be detrimental to health or safety requirements.

SECTION 306
TRENCHING, EXCAVATION AND BACKFILL

[PW] Section 306 is amended by adding section:

306.2.4 Trench safety. All excavations shall follow guidelines as required by OSHA and/or the Administrative Authority. The most restrictive rules shall apply.

SECTION 307
STRUCTURAL SAFETY

Section 307.5 is amended to read:

307.5 Trench location. Trenches excavated parallel to footings of building structures shall not extend below the 45-degree bearing plane of the footing or wall unless authorized by the Administrative Authority. Where re-routing is necessary, the person(s) and/or Contractor responsible for obtaining the permit shall be required to submit drawings for approval.

CHAPTER 4
FIXTURE, FAUCETS AND FIXTURE FITTINGS

SECTION 401
GENERAL

[CC] Section 401.3.1 is added.

401.3.1 Rain sensing. An approved rain sensing system shall be installed on all new automatic lawn sprinkler systems. Said rain sensing system shall be capable of turning the lawn sprinkler system off in the event adequate rain has fallen.

[CC] Section 401.3.2 is added.

401.3.2 Metering. Each individual dwelling unit shall be metered in such a way that all water used by said dwelling unit can be recorded and billed. The maintenance and repair of said meters shall be the responsibility of the owner of the metered property.

SECTION 403

MINIMUM PLUMBING FACILITIES

[EH] Section 403.4 is added.

403.4 Access. There shall be no access through a toilet room to any portion of a building. Access to toilet rooms shall not be through food preparation areas, except for toilet room facilities provided exclusively for the use of employees in the food preparation area.

This shall not apply to residential occupancies within the unit.

SECTION 413
FOOD WASTE GRINDER UNITS

[CPB] Section 413.2 is amended to read:

413.2 Domestic food waste grinder outlets. Domestic food waste outlets may be 1 ½" but shall be connected to a drain of at least 2" in diameter.

[PW] Section 413.3 is amended by adding:

413.3.1 Discharge into grease interceptor. All food waste disposals in commercial kitchens shall be connected to and discharge into the grease interceptor.

Exception:

Vegetable preparation area disposal may discharge to either sanitary or grease waste system.

CHAPTER 6
WATER SUPPLY AND DISTRIBUTION

SECTION 603
WATER SERVICE

[DW] Section 603.1 is amended to read:

603.1 Size of water service pipe. The water service pipe shall be sized to supply water to the structure in the quantities and at the pressures required in this code. The minimum diameter of water service pipes shall be ¾ inch (19 mm). The service line shall remain the same size from tap through meter, then may be increased in size thereafter.

SECTION 608
PROTECTION OF POTABLE WATER SUPPLY

[DW, FCWA] Section 608.1 is amended by adding:

608.1.1 Backflow devices. Backflow devices installed in water service lines shall be inspected and maintained per Denver Water/State of Colorado Clean Water Act, and the Colorado Cross-Connection Control Manual, most recent edition, as published by the Colorado Department of Public Health and Environment Water Quality Control Division.

Section 608.7 is amended by adding exception.

608.7 Stop-and-waste valves prohibited.

Exception:

Combination stop and waste valves may be installed underground if an approved means of removing wastewater from the seep hole is provided, such as a gravel bedding etc.

Section 608.15.2 is amended by adding:

608.15.2.1 Waste Discharge. The waste discharge from a reduced pressure device shall be discharged to an approved location. If this discharge is by means of a pump, the pump shall be sized to handle the maximum discharge of the device.

CHAPTER 7
SANITARY DRAINAGE

SECTION 703
BUILDING SEWER

[PW] Section 703 is amended by adding the following section:

703.6 Slope of building sewer piping. Building sewers shall be installed at uniform grade or slope. The minimum grade of building sewers shall be in accordance with Denver Wastewater Management Standards.

SECTION 708
CLEANOUTS

[PW] Section 708.3.3 is deleted and replaced with the following:

708.3.3 Changes of direction. Cleanouts shall be installed at each change of direction of the building drain or horizontal waste or soil lines greater than 135 degrees (2.36 rad.). Where more than one change of direction occurs in a run of piping, only one cleanout shall be required for each 40 feet (12 192 mm) of developed length of the drainage piping.

[PW] Section 708.3.5 is deleted and replaced with the following:

708.3.5 Building drain and building sewer junction. There shall be a cleanout at the junction of the building sewer. An approved two-way cleanout shall be used and brought up to finished grade. Minimum size shall be 4” or as approved by Denver Waste Water Management.

SECTION 712
SUMPS AND EJECTORS

Section 712.4 is amended by adding the following:

712.4 Sewage pumps and sewage ejectors. In public use occupancies, dual (duplex) sewage ejectors shall be required and shall be arranged to function independently in case of mechanical failure. All dual ejectors shall be alarmed to provide visual and/or audible notification of failure.

Exception:

A single ejector pump may be used in commercial application when it is used for a single use kitchen sink and/or dishwasher and/or disposer.

CHAPTER 8
INDIRECT/SPECIAL WASTE

SECTION 803
SPECIAL WASTES

[DW] Section 803.4 is added.

803.4 Cooling water. Domestic water used for cooling purposes shall be consumed or recycled and shall not be wasted to storm drain, above-ground drainage or below-ground drainage unless specifically approved by Denver Water.

Exception:

Diesel driven fire pump.

SECTION 805
FOOD WASTE

[EH] Section 805.1 is added.

805.1 Food waste disposers. An approved food waste disposer shall be required whenever food is to be prepared either commercially or in area containing a refrigerator, sink and stove.

Exception:

A food waste disposer may be deleted for the following facilities: (1) all food is prepared off site and/or is prepackaged; (2) all food is served with disposable plates or trays and utensils.

CHAPTER 9
VENTS

SECTION 904
VENT TERMINALS

Section 904.1 is deleted and replaced with the following:

904.1 Roof extension. All open vent pipes that extend through a roof shall be terminated at least 12 inches (305 mm) above the roof, except that where a roof is to be used for any purpose other than weather protection, the vent extensions shall be run at least 7 feet (2134 mm) above the roof.

SECTION 905
VENT CONNECTIONS AND GRADES

Section 905.4 is amended by deleting the exception and replacing with the following:

Exception:

If structural conditions do not allow the vent to be taken off vertically, the vent shall be run horizontally to the nearest wall. All fittings shall be drainage type. A cleanout shall be installed in the vent line.

CHAPTER 10
TRAPS, INTERCEPTORS AND SEPARATORS

SECTION 1003
INTERCEPTORS AND SEPARATORS

[PW] Section 1003.2 is deleted and replaced with the following:

1003.2 Approval. The size, type and location of each interceptor and of each separator shall be designed and installed in accordance with the manufacturers' instructions and the requirements of this section based on the anticipated conditions of use. Wastes that do not require treatment or separation shall not be discharged into any interceptor or separator. Prior to installation of any interceptor or separator and their associated piping, plans shall be submitted to Wastewater Management for approval.

Section 1005 is added.

SECTION 1005
ABANDONED INTERCEPTORS

[PW] Section 1005.1 Abandoned food/oil grease interceptors and sand/oil interceptors. All food/oil/grease interceptors and sand/oil interceptors that are to be abandoned or by-passed, shall have all piping removed, the structure capped or plugged and the lid broken as to make it unusable. It shall be pumped clean and filled with granular material to satisfy Denver Wastewater Management standards.

CHAPTER 11
STORM DRAINAGE

SECTION 1101
GENERAL

[PW] Section 1101.1 is deleted and replaced with the following:

1101.1 Scope. The provisions of this chapter shall govern the materials, design, construction and installation of storm drainage. That portion of the storm drainage system from the building to the public storm sewer shall be as required by Denver Wastewater Management.

SECTION 1106
SIZE OF CONDUCTORS, LEADERS AND STORM DRAINS

Section 1106.1 is deleted and replaced with the following:

1106.1 General. The size of the vertical conductors and leaders, building storm sewers and any horizontal branches of such drains shall be based on 3" (7.6 mm) per hour.

IPC APPENDICES
STATUS OF APPENDICES ON ADOPTION

The following Appendices are adopted:

Appendix E Sizing of Water Piping

Appendix F Structural Safety

DENVER AMENDMENTS TO THE 2006 EDITION OF THE INTERNATIONAL FUEL & GAS CODE AND APPENDICES AS PUBLISHED BY INTERNATIONAL CODE COUNCIL (ICC)

CHAPTER 1
ADMINISTRATION

SECTION 101 (IFGC)
GENERAL

Section 101.1 Title. Is amended by inserting "City and County of Denver" for the name of the jurisdiction.

Sections IFGC 103 through 106, 108 and 109 are amended by deleting those sections in their entirety. The "Administration of the 2007 Denver Building Code" provisions shall govern.

CHAPTER 4
GAS PIPING INSTALLATIONS

SECTION 403 (IFGC)
PIPING MATERIALS

Section 403.4.3 Copper and brass is deleted in its entirety and replaced with the following:

Copper and brass pipe shall not be used.

Section 403.5.2 Copper and brass tubing is deleted in its entirety and replaced with the following:

Copper and brass tubing shall not be used.

SECTION 404 (IFGC)
PIPING SYSTEM INSTALLATION

Section 404.1 Prohibited locations is amended by adding the following paragraph:

Gas meters shall not be located in or under any building unless the meter is located in its own dedicated, adequately ventilated vault.

SECTION 406 (IFGC)
INSPECTION, TESTING AND PURGING

Section 406.4.1 is deleted and replaced with the following:

406.4.1 Test pressure. The test pressure to be used shall be no less than 1½ times the proposed maximum working pressure, but not less than 10 psig (69 kPa gauge), irrespective of design pressure. For welded piping and for piping carrying gas at pressures exceeding 14 inches water column (3.5 kPa gauge) pressure, the test pressure shall be no less than 60 psig (414 kPa gauge). Where the test pressure exceeds 125 psig (862 kPa gauge), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe.

CHAPTER 5
CHIMNEYS AND VENTS

SECTION 505 (IFGC)
DIRECT VENT, INTEGRAL VENT, MECHANICAL VENT AND VENTILATION /EXHAUST HOOD VENTING

Section 505.1.1 Commercial cooking appliances vented by exhaust hoods is amended by modifying the second to last sentence as follows:

Where a solenoid valve is installed in the gas piping as part of an interlock system, gas piping shall not be installed to bypass such valve except where such a bypass is intended and sized for standing pilot light(s). If a bypass is installed to maintain the function of standing pilot light(s), the entire interlocked solenoid and bypass assembly must be installed external to the equipment and downstream of any emergency shut-off solenoid valve.

CHAPTER 6
SPECIFIC APPLIANCES

SECTION 602 (IFGC)
DECORATIVE APPLIANCES FOR INSTALLATION IN FIREPLACES

Section 602 is amended by adding the following paragraph:

602.4 Wood-burning appliances. Installation of new factory-built wood-burning appliances is restricted to certified wood stoves as approved by the Environmental Protection Agency. Appliances must be listed by an approved testing lab. If a wood-burning appliance is not on the EPA approved list, it cannot be installed unless it is converted to a gas log fireplace in accordance with the requirements of Chapter 6.

SECTION 609 (IFGC)
FLOOR FURNACES

Section 609 Floor Furnaces is deleted in its entirety and replaced with the following.

Floor furnaces are prohibited in Denver.

SECTION 621 (IFGC)
UNVENTED ROOM HEATERS

Section 621 Unvented Room Heaters is deleted in its entirety and replaced with the following.

Unvented room heaters are prohibited in Denver.

SECTION 623 (IFGC)
COOKING APPLIANCES

Section 623.3 is amended by adding the following paragraph:

623.3.1 Residential cooking appliances vented by exhaust hoods. Where residential cooking appliances are gas-fired, a fan powered exhaust system shall be installed and must be vented to the outside. System shall be sized and installed in accordance with manufacturer's instructions.

DENVER AMENDMENTS TO THE 2006 EDITION OF THE INTERNATIONAL ENERGY CONSERVATION CODE AND APPENDICES AS PUBLISHED BY INTERNATIONAL CODE COUNCIL (ICC)

CHAPTER 1
ADMINISTRATION

SECTION 101
GENERAL

Section 101.1 Title is deleted and replaced with the following:

101.1 Title. These regulations shall be known as the Energy Code of the City and County of Denver, and shall be cited as such. It is referred to herein as "this code".

CHAPTER 4
RESIDENTIAL ENERGY EFFICIENCY

SECTION 401.2
Section 401.2 is amended by adding the following:

3. The results from a code complain software program can be utilized to show compliance. "REScheck™" – Residential Energy Code Compliance Software is one program currently being accepted. This program was developed by the Department of Energy can be downloaded for free at http://www.energycodes.gov/compliance_tools.stm.

CHAPTER 5
IECC COMMERCIAL ENERGY EFFICIENCY

SECTION 501
GENERAL

Section 501.2 is amended by adding the following:

The results from a code compliant software can be utilized to show compliance. "COMcheck™" - Commercial Energy Code Compliance Software is one program currently being accepted. This program developed by the Department of Energy can be downloaded for free at http://www.energycodes.gov/compliance_tools.stm.

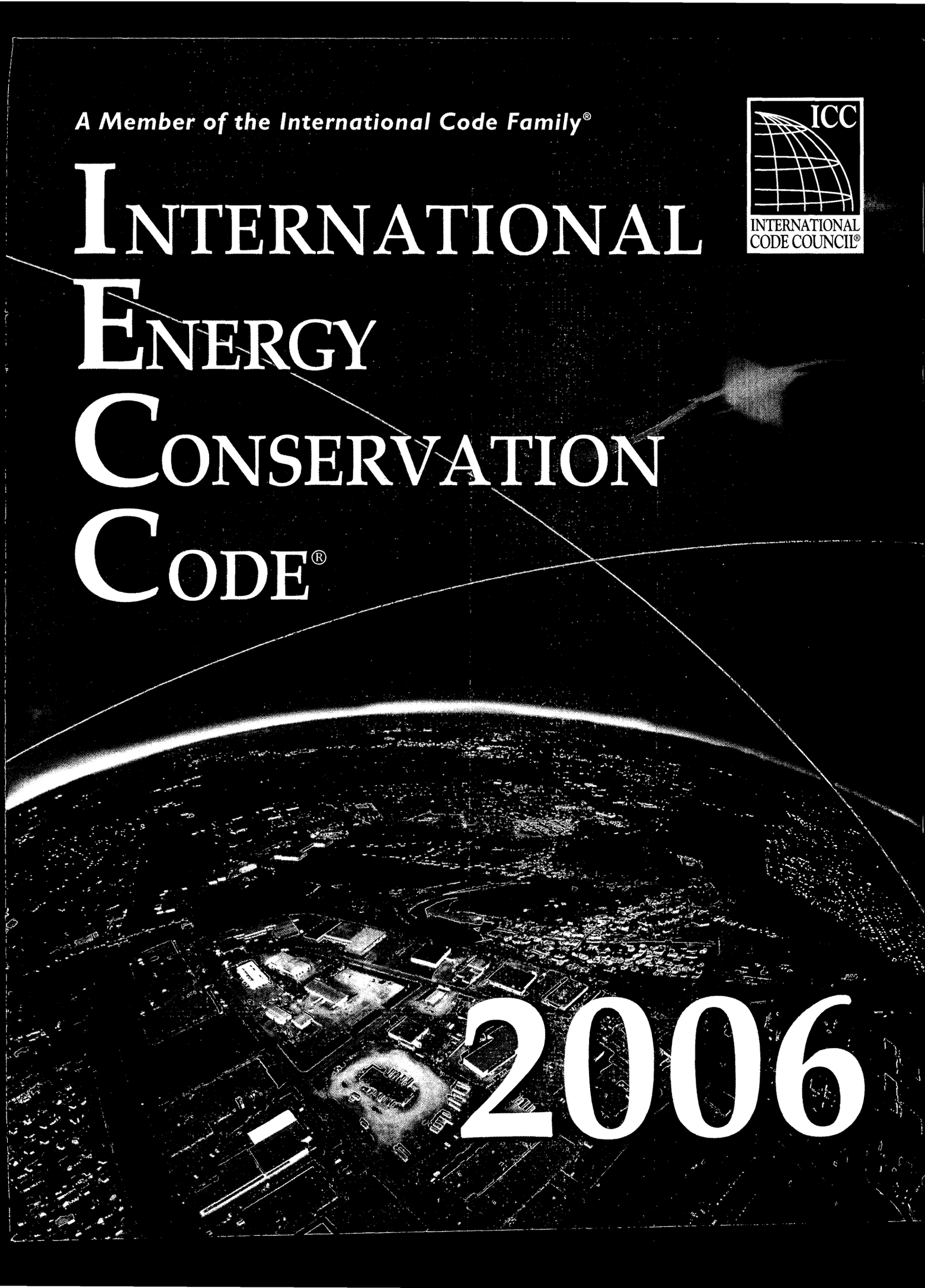
Section 505.2, 505.3, ASHRAE 90.1 Section 9.4.1, 9.4.2 Lighting controls is amended by adding the following exception:

Exception:

Tenant finishes and remodels which do not require a Certificate of Occupancy.

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PREFACE

Introduction

Internationally, code officials recognize the need for a modern, up-to-date energy conservation code addressing the design of energy-efficient building envelopes and installation of energy efficient mechanical, lighting and power systems through requirements emphasizing performance. The *International Energy Conservation Code*®, in this 2006 edition, is designed to meet these needs through model code regulations that will result in the optimal utilization of fossil fuel and nondepletable resources in all communities, large and small.

This comprehensive energy conservation code establishes minimum regulations for energy efficient buildings using prescriptive and performance-related provisions. It is founded on broad-based principles that make possible the use of new materials and new energy efficient designs. This 2006 edition is fully compatible with all the *International Codes*® (I-Codes®) published by the International Code Council (ICC)®, including: the *International Building Code*®, ICC *Electrical Code*®, *International Existing Building Code*®, *International Fire Code*®, *International Fuel Gas Code*®, *International Mechanical Code*®, ICC *Performance Code*®, *International Plumbing Code*®, *International Private Sewage Disposal Code*®, *International Property Maintenance Code*®, *International Residential Code*®, *International Wildland-Urban Interface Code*™ and *International Zoning Code*®.

The *International Energy Conservation Code* provisions provide many benefits, among which is the model code development process that offers an international forum for energy professionals to discuss performance and prescriptive code requirements. This forum provides an excellent arena to debate proposed revisions. This model code also encourages international consistency in the application of provisions.

Development

The first edition of the *International Energy Conservation Code* (1998) was based on the 1995 edition of the *Model Energy Code* promulgated by the Council of American Building Officials (CABO) and included changes approved through the CABO Code Development Procedures through 1997. CABO assigned all rights and responsibilities to the International Code Council and its three statutory members at that time, including Building Officials and Code Administrators International, Inc. (BOCA), International Conference of Building Officials (ICBO) and Southern Building Code Congress International (SBCCI). This 2006 edition presents the code as originally issued, with changes reflected in the 2003 edition and further changes approved through the ICC Code Development Process through 2005. A new edition such as this is promulgated every three years.

This code is founded on principles intended to establish provisions consistent with the scope of an energy conservation code that adequately conserves energy; provisions that do not unnecessarily increase construction costs; provisions that do not restrict the use of new materials, products or methods of construction; and provisions that do not give preferential treatment to particular types or classes of materials, products or methods of construction.

Adoption

The *International Energy Conservation Code* is available for adoption and use by jurisdictions internationally. Its use within a governmental jurisdiction is intended to be accomplished through adoption by reference in accordance with proceedings establishing the jurisdiction's laws. At the time of adoption, jurisdictions should insert the appropriate information in provisions requiring specific local information, such as the name of the adopting jurisdiction. These locations are shown in bracketed words in small capital letters in the code and in the sample ordinance. The sample adoption ordinance on page v addresses several key elements of a code adoption ordinance, including the information required for insertion into the code text.

Maintenance

The *International Energy Conservation Code* is kept up to date through the review of proposed changes submitted by code enforcing officials, industry representatives, design professionals and other interested parties. Proposed changes are carefully considered through an open code development process in which all interested and affected parties may participate.

The contents of this work are subject to change both through the Code Development Cycles and the governmental body that enacts the code into law. For more information regarding the code development process, contact the Code and Standard Development Department of the International Code Council.

While the development procedure of the *International Energy Conservation Code* assures the highest degree of care, ICC, its members and those participating in the development of this code do not accept any liability resulting from compliance or noncompliance with the provisions because ICC and its members do not have the power or authority to police or enforce compliance with the contents of this code. Only the governmental body that enacts the code into law has such authority.

Letter Designations in Front of Section Numbers

In each code development cycle, proposed changes to this code are considered at the Code Development Hearing by the International Energy Conservation Code Development Committee, whose action constitutes a recommendation to the voting membership for final action on the proposed change. Proposed changes to a code section whose number begins with a letter in brackets are considered by a different code development committee. For instance, proposed changes to code sections which have the letter [EB] in front (e.g., [EB] 101.2.2.1), are considered by the International Existing Building Code Development Committee at the Code Development Hearing. Where this designation is applicable to the entire content of a main section of the code, the designation appears at the main section number and title and is not repeated at every subsection in that section.

The content of sections in this code which begin with a letter designation is maintained by another code development committee in accordance with the following:

[B] = International Building Code Development Committee;

[EB] = International Existing Building Code Development Committee; and

[M] = International Mechanical Code Development Committee.

Marginal Markings

Solid vertical lines in the margins within the body of the code indicate a technical change from the requirements of the 2003 edition. Deletion indicators in the form of an arrow (➜) are provided in the margin where an entire section, paragraph, exception or table has been deleted or an item in a list of items or a table has been deleted.

ORDINANCE

The International Codes are designed and promulgated to be adopted by reference by ordinance. Jurisdictions wishing to adopt the 2006 *International Energy Conservation Code* as an enforceable regulation governing energy efficient building envelopes and installation of energy efficient mechanical, lighting and power systems should ensure that certain factual information is included in the adopting ordinance at the time adoption is being considered by the appropriate governmental body. The following sample adoption ordinance addresses several key elements of a code adoption ordinance, including the information required for insertion into the code text.

SAMPLE ORDINANCE FOR ADOPTION OF THE *INTERNATIONAL ENERGY CONSERVATION CODE* ORDINANCE NO._____

An ordinance of the **[JURISDICTION]** adopting the 2006 edition of the *International Energy Conservation Code*, regulating and governing energy efficient building envelopes and installation of energy efficient mechanical, lighting and power systems in the **[JURISDICTION]**; providing for the issuance of permits and collection of fees therefor; repealing Ordinance No. _____ of the **[JURISDICTION]** and all other ordinances and parts of the ordinances in conflict therewith.

The **[GOVERNING BODY]** of the **[JURISDICTION]** does ordain as follows:

Section 1.That a certain document, three (3) copies of which are on file in the office of the **[TITLE OF JURISDICTION'S KEEPER OF RECORDS]** of **[NAME OF JURISDICTION]**, being marked and designated as the *International Energy Conservation Code*, 2006 edition, as published by the International Code Council, be and is hereby adopted as the Energy Conservation Code of the **[JURISDICTION]**, in the State of **[STATE NAME]** for regulating and governing energy efficient building envelopes and installation of energy efficient mechanical, lighting and power systems as herein provided; providing for the issuance of permits and collection of fees therefor; and each and all of the regulations, provisions, penalties, conditions and terms of said Energy Conservation Code on file in the office of the **[JURISDICTION]** are hereby referred to, adopted, and made a part hereof, as if fully set out in this ordinance, with the additions, insertions, deletions and changes, if any, prescribed in Section 2 of this ordinance.

Section 2.The following sections are hereby revised:

Section 101.1. Insert: **[NAME OF JURISDICTION]**.

Section 3.That Ordinance No. _____ of **[JURISDICTION]** entitled **[FILL IN HERE THE COMPLETE TITLE OF THE ORDINANCE OR ORDINANCES IN EFFECT AT THE PRESENT TIME SO THAT THEY WILL BE REPEALED BY DEFINITE MENTION]** and all other ordinances or parts of ordinances in conflict herewith are hereby repealed.

Section 4.That if any section, subsection, sentence, clause or phrase of this ordinance is, for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this ordinance. The **[GOVERNING BODY]** hereby declares that it would have passed this ordinance, and each section, subsection, clause or phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses and phrases be declared unconstitutional.

Section 5.That nothing in this ordinance or in the Energy Conservation Code hereby adopted shall be construed to affect any suit or proceeding impending in any court, or any rights acquired, or liability incurred, or any cause or causes of action acquired or existing, under any act or ordinance hereby repealed as cited in Section 3 of this ordinance; nor shall any just or legal right or remedy of any character be lost, impaired or affected by this ordinance.

Section 6.That the **[JURISDICTION'S KEEPER OF RECORDS]** is hereby ordered and directed to cause this ordinance to be published. (An additional provision may be required to direct the number of times the ordinance is to be published and to specify that it is to be in a newspaper in general circulation. Posting may also be required.)

Section 7.That this ordinance and the rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effect **[TIME PERIOD]** from and after the date of its final passage and adoption.

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CHAPTER 1
ADMINISTRATION

This chapter has been revised in its entirety; there will be no marginal markings.

SECTION 101
SCOPE AND GENERAL REQUIREMENTS

101.1 Title. This code shall be known as the *International Energy Conservation Code* of [NAME OF JURISDICTION], and shall be cited as such. It is referred to herein as "this code."

101.2 Scope. This code applies to residential and commercial buildings.

101.3 Intent. This code shall regulate the design and construction of buildings for the effective use of energy. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve the effective use of energy. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

101.4 Applicability.

101.4.1 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

101.4.2 Historic buildings. Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code.

101.4.3 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations, or repairs shall not create an unsafe or hazardous condition or overload existing building systems.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
3. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall or floor cavity is not exposed.

101.4.4 Change in occupancy. Buildings undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.

101.4.5 Mixed occupancy. Where a building includes both residential and commercial occupancies, each occupancy shall be separately considered and meet the applicable provisions of Chapter 4 for residential and Chapter 5 for commercial.

101.5 Compliance. Residential buildings shall meet the provisions of Chapter 4. Commercial buildings shall meet the provisions of Chapter 5.

101.5.1 Compliance materials. The code official shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

101.5.2 Low energy buildings. The following buildings, or portions thereof, separated from the remainder of the building by building thermal envelope assemblies complying with this code shall be exempt from the building thermal envelope provisions of this code:

1. Those with a peak design rate of energy usage less than 3.4 Btu/h·ft^2 (10.7 W/m^2) or 1.0 watt/ft^2 (10.7 W/m^2) of floor area for space conditioning purposes.
2. Those that do not contain conditioned space.

SECTION 102
MATERIALS, SYSTEMS AND EQUIPMENT

102.1 Identification. Materials, systems and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this code.

102.1.1 Building thermal envelope insulation. An *R*-value identification mark shall be applied by the manufacturer to each piece of building thermal envelope insulation 12 inches (305 mm) or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and *R*-value of insulation installed in each element of the building thermal envelope. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled *R*-value, installed density, coverage area and number of bags installed shall be listed on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and *R*-value of installed thickness shall be listed on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

102.1.1.1 Blown or sprayed roof/ceiling insulation. The thickness of blown in or sprayed roof/ceiling insulation (fiberglass or cellulose) shall be written in inches (mm) on markers that are installed at least one for every 300 square feet (28 m^2) throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers a minimum of 1 inch (25 mm) in height. Each marker shall face the attic access opening. Spray polyurethane foam thickness and installed *R*-value shall be listed on certification provided by the insulation installer.

102.1.2 Insulation mark installation. Insulating materials shall be installed such that the manufacturer's *R*-value mark is readily observable upon inspection.

102.1.3 Fenestration product rating. *U*-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table 102.1.3(1) or 102.1.3(2). The solar heat gain coefficient (SHGC) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled SHGC shall be assigned a default SHGC from Table 102.1.3(3).

TABLE 102.1.3(1)
DEFAULT GLAZED FENESTRATION *U*-FACTOR

FRAME TYPE	SINGLE PANE	DOUBLE PANE	SKYLIGHT	
			Single	Double
Metal	1.20	0.80	2.00	1.30
Metal with Thermal Break	1.10	0.65	1.90	1.10
Nonmetal or Metal Clad	0.95	0.55	1.75	1.05
Glazed Block	0.60			

TABLE 102.1.3(2)
DEFAULT DOOR *U*-FACTORS

DOOR TYPE	*U*-FACTOR
Uninsulated Metal	1.20
Insulated Metal	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35

TABLE 102.1.3(3)
DEFAULT GLAZED FENESTRATION SHGC

SINGLE GLAZED		DOUBLE GLAZED		
Clear	Tinted	Clear	Tinted	GLAZED BLOCK
0.8	0.7	0.7	0.6	0.6

102.2 Installation. All materials, systems and equipment shall be installed in accordance with the manufacturer's installation instructions and the *International Building Code*.

102.2.1 Protection of exposed foundation insulation. Insulation applied to the exterior of basement walls, crawlspace walls and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective covering to prevent the degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend a minimum of 6 inches (153 mm) below grade.

102.3 Maintenance information. Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

SECTION 103
ALTERNATE MATERIALS—METHOD OF CONSTRUCTION, DESIGN OR INSULATING SYSTEMS

103.1 General. This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been approved by the code official as meeting the intent of this code.

103.1.1 Above code programs. The code official or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings approved in writing by such an energy efficiency program shall be considered in compliance with this code.

SECTION 104
CONSTRUCTION DOCUMENTS

104.1 General. Construction documents and other supporting data shall be submitted in one or more sets with each application for a permit. The code official is authorized to require necessary construction documents to be prepared by a registered design professional.

Exception: The code official is authorized to waive the requirements for construction documents or other supporting data if the code official determines they are not necessary to confirm compliance with this code.

104.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when approved by the code official. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, insulation materials and their *R*-values; fenestration *U*-factors and SHGCs; system and equipment efficiencies, types, sizes

and controls; duct sealing, insulation and location; and air sealing details.

SECTION 105
INSPECTIONS

105.1 General. Construction or work for which a permit is required shall be subject to inspection by the code official.

105.2 Required approvals. No work shall be done on any part of the building beyond the point indicated in each successive inspection without first obtaining the written approval of the code official. No construction shall be concealed without being inspected and approved.

105.3 Final inspection. The building shall have a final inspection and not be occupied until approved.

105.4 Reinspection. A building shall be reinspected when determined necessary by the code official.

SECTION 106
VALIDITY

106.1 General. If a portion of this code is held to be illegal or void, such a decision shall not affect the validity of the remainder of this code.

SECTION 107
REFERENCED STANDARDS

107.1 General. The standards, and portions thereof, referred to in this code and listed in Chapter 6 shall be considered part of the requirements of this code to the extent of such reference.

107.2 Conflicting requirements. Where the provisions of this code and the referenced standards conflict, the provisions of this code shall take precedence.

CHAPTER 2
DEFINITIONS

This chapter has been revised in its entirety; there will be no marginal markings.

SECTION 201
GENERAL

201.1 Scope. Unless stated otherwise, the following words and terms in this code shall have the meanings indicated in this chapter.

201.2 Interchangeability. Words used in the present tense include the future; words in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural includes the singular.

201.3 Terms defined in other codes. Terms that are not defined in this code but are defined in the *International Building Code*, ICC *Electrical Code*, *International Fire Code*, *International Fuel Gas Code*, *International Mechanical Code*, *International Plumbing Code*, or the *International Residential Code* shall have the meanings ascribed to them in those codes.

201.4 Terms not defined. Terms not defined by this chapter shall have ordinarily accepted meanings such as the context implies.

SECTION 202
GENERAL DEFINITIONS

ABOVE GRADE WALL. A wall more than 50 percent above grade and enclosing conditioned space. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof, and skylight shafts.

ACCESSIBLE. Admitting close approach as a result of not being guarded by locked doors, elevation or other effective means (see "Readily accessible").

ADDITION. An extension or increase in the conditioned space floor area or height of a building or structure.

ALTERATION. Any construction or renovation to an existing structure other than repair or addition that requires a permit. Also, a change in a mechanical system that involves an extension, addition or change to the arrangement, type or purpose of the original installation that requires a permit.

APPROVED. Approval by the code official as a result of investigation and tests conducted by him or her, or by reason of accepted principles or tests by nationally recognized organizations.

AUTOMATIC. Self-acting, operating by its own mechanism when actuated by some impersonal influence, as, for example, a change in current strength, pressure, temperature or mechanical configuration (see "Manual").

BASEMENT WALL. A wall 50 percent or more below grade and enclosing conditioned space.

BUILDING. Any structure used or intended for supporting or sheltering any use or occupancy.

BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, floor, roof, and any other building element that enclose conditioned space. This boundary also includes the boundary between conditioned space and any exempt or unconditioned space.

CODE OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

COMMERCIAL BUILDING. For this code, all buildings that are not included in the definition of "Residential buildings."

CONDITIONED FLOOR AREA. The horizontal projection of the floors associated with the conditioned space.

CONDITIONED SPACE. An area or room within a building being heated or cooled, containing uninsulated ducts, or with a fixed opening directly into an adjacent conditioned space.

CRAWL SPACE WALL. The opaque portion of a wall that encloses a crawl space and is partially or totally below grade.

CURTAIN WALL. Fenestration products used to create an external nonload-bearing wall that is designed to separate the exterior and interior environments.

DUCT. A tube or conduit utilized for conveying air. The air passages of self-contained systems are not to be construed as air ducts.

DUCT SYSTEM. A continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans and accessory air-handling equipment and appliances.

DWELLING UNIT. A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

ECONOMIZER, AIR. A duct and damper arrangement and automatic control system that allows a cooling system to supply outside air to reduce or eliminate the need for mechanical cooling during mild or cold weather.

ECONOMIZER, WATER. A system where the supply air of a cooling system is cooled indirectly with water that is itself cooled by heat or mass transfer to the environment without the use of mechanical cooling.

ENERGY ANALYSIS. A method for estimating the annual energy use of the proposed design and standard reference design based on estimates of energy use.

ENERGY COST. The total estimated annual cost for purchased energy for the building functions regulated by this code, including applicable demand charges.

ENERGY RECOVERY VENTILATION SYSTEM. Systems that employ air-to-air heat exchangers to recover energy

from exhaust air for the purpose of preheating, precooling, humidifying or dehumidifying outdoor ventilation air prior to supplying the air to a space, either directly or as part of an HVAC system.

ENERGY SIMULATION TOOL. An approved software program or calculation-based methodology that projects the annual energy use of a building.

ENTRANCE DOOR. Fenestration products used for ingress, egress and access in nonresidential buildings, including, but not limited to, exterior entrances that utilize latching hardware, automatic closers and contain over 50 percent glass specifically designed to withstand heavy use and possibly abuse.

EXTERIOR WALL. Walls including both above grade walls and basement walls.

FENESTRATION. Skylights, roof windows, vertical windows (fixed or moveable), opaque doors, glazed doors, glazed block, and combination opaque/glazed doors. Fenestration includes products with glass and non-glass glazing materials.

HEAT TRAP. An arrangement of piping and fittings, such as elbows, or a commercially available heat trap that prevents thermosyphoning of hot water during standby periods.

HEATED SLAB. Slab-on-grade construction in which the heating elements, hydronic tubing, or hot air distribution system is in contact with, or placed within or under the slab.

HUMIDISTAT. A regulatory device, actuated by changes in humidity, used for automatic control of relative humidity.

INFILTRATION. The uncontrolled inward air leakage into a building caused by the pressure effects of wind or the effect of differences in the indoor and outdoor air density or both.

INSULATING SHEATHING. An insulating board with a core material having a minimum *R*-value of R-2.

LABELED. Devices, equipment, or materials to which have been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, inspection agency or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items that attests to compliance with a specific standard.

LISTED. Equipment, appliances, assemblies or materials included in a list published by an approved testing laboratory, inspection agency or other organization concerned with product evaluation that maintains periodic inspection of production of listed equipment, appliances, assemblies or material, and whose listing states either that the equipment, appliances, assemblies, or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

LOW-VOLTAGE LIGHTING. Lighting equipment powered through a transformer such as a cable conductor, a rail conductor and track lighting.

MANUAL. Capable of being operated by personal intervention (see "Automatic").

PROPOSED DESIGN. A description of the proposed building used to estimate annual energy use for determining compliance based on total building performance.

READILY ACCESSIBLE. Capable of being reached quickly for operation, renewal or inspection without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders or access equipment (see "Accessible").

REPAIR. The reconstruction or renewal of any part of an existing building.

RESIDENTIAL BUILDING. For this code, includes R-3 buildings, as well as R-2 and R-4 buildings three stories or less in height above grade.

***R*-VALUE (THERMAL RESISTANCE).** The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area ($h \cdot ft^2 \cdot °F/Btu$) [$(m^2 \cdot K)/W$].

ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof covering, underlayment, roof deck, insulation, vapor retarder and interior finish.

SCREW LAMP HOLDERS. A lamp base that requires a screw-in-type lamp, such as a compact-fluorescent, incandescent, or tungsten-halogen bulb.

SERVICE WATER HEATING. Supply of hot water for purposes other than comfort heating.

SKYLIGHT. Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Glazing material in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls is included in this definition.

SLEEPING UNIT. A room or space in which people sleep, which can also include permanent provisions for living, eating, and either sanitation or kitchen facilities but not both. Such rooms and spaces that are also part of a dwelling unit are not sleeping units.

SOLAR HEAT GAIN COEFFICIENT (SHGC). The ratio of the solar heat gain entering the space through the fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation which is then reradiated, conducted or convected into the space.

STANDARD REFERENCE DESIGN. A version of the proposed design that meets the minimum requirements of this code and is used to determine the maximum annual energy use requirement for compliance based on total building performance.

STOREFRONT. A nonresidential system of doors and windows mulled as a composite fenestration structure that has been designed to resist heavy use and possible abuse and provide a high level of resistance to wind load and impact from wind borne debris. Storefront systems include, but are not limited to, exterior fenestration systems that span from the floor level or above to the ceiling of the same story on commercial buildings.

SUNROOM. A one-story structure attached to a dwelling with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof.

THERMAL ISOLATION. Physical and space conditioning separation from conditioned space(s). The conditioned space(s) shall be controlled as separate zones for heating and cooling or conditioned by separate equipment.

THERMOSTAT. An automatic control device used to maintain temperature at a fixed or adjustable set point.

***U*-FACTOR (THERMAL TRANSMITTANCE).** The coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h · ft^2 · °F) [W/(m^2 · K)].

VAPOR RETARDER. A vapor resistant material, membrane or covering such as foil, plastic sheeting, or insulation facing having a permeance rating of 1 perm (5.7×10^{-11} kg/Pa · s · m^2) or less when tested in accordance with the dessicant method using Procedure A of ASTM E 96. Vapor retarders limit the amount of moisture vapor that passes through a material or wall assembly.

VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

VENTILATION AIR. That portion of supply air that comes from outside (outdoors) plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.

ZONE. A space or group of spaces within a building with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained throughout using a single controlling device.

CHAPTER 3
CLIMATE ZONES

This chapter has been revised in its entirety; there will be no marginal markings.

SECTION 301
CLIMATE ZONES

301.1 General. Climate zones from Figure 301.1 or Table 301.1 shall be used in determining the applicable requirements from Chapters 4 and 5. Locations not in Table 301.1 (outside the US) shall be assigned a climate zone based on Section 301.3.

301.2 Warm humid counties. Warm humid counties are listed in Table 301.2.

301.3 International climate zones. The climate zone for any location outside the United States shall be determined by applying Table 301.3(1) and then Table 301.3(2).

301.3.1 Warm humid criteria. "Warm humid" locations shall be defined as locations where either of the following conditions occurs:

1. 67°F (19.4°C) or higher wet-bulb temperature for 3,000 or more hours during the warmest six consecutive months of the year;
2. 73°F (22.8°C) or higher wet-bulb temperature for 1,500 or more hours during the warmest six consecutive months of the year.

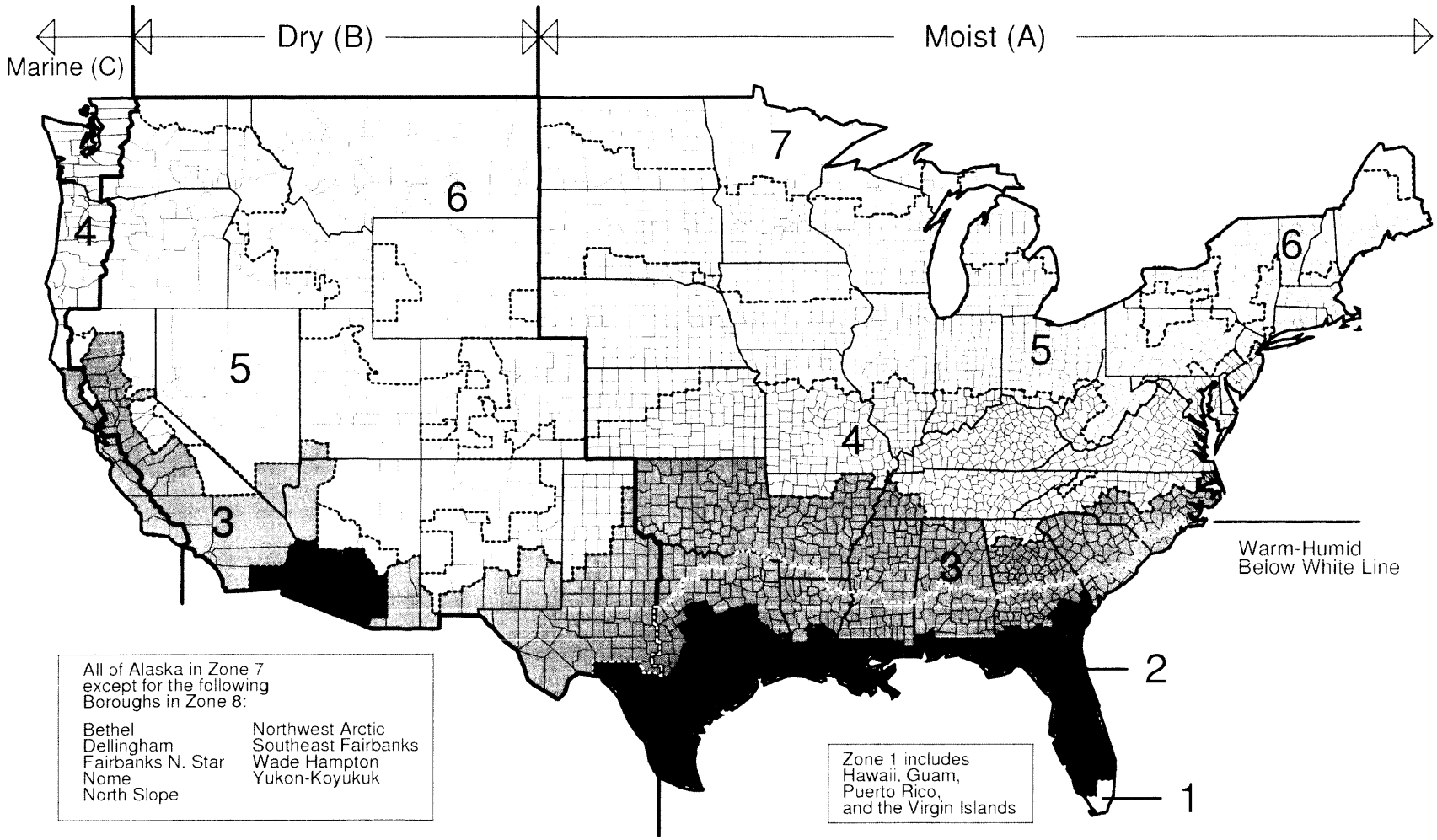


FIGURE 301.1
CLIMATE ZONES

TABLE 301.1
CLIMATE ZONES BY STATE, COUNTY AND TERRITORIES

ALABAMA

Zone 3 except

Zone 2

Baldwin

Mobile

ALASKA

Zone 7 except

Zone 8

Bethel

Dellingham

Fairbanks

Nome

North Slope

North Star

Northwest Arctic

Southeast Fairbanks

Wade Hampton

Yukon-Koyukuk

ARIZONA

Zone 3 except

Zone 2

La Paz

Maricopa

Pima

Pinal

Yuma

Zone 4

Gila

Yavapai

Zone 5

Apache

Coconino

Navajo

ARKANSAS

Zone 3 except

Zone 4

Baxter

Benton

Boone

Carroll

Fulton

Izard

Madison

Marion

Newton

Searcy

Stone

Washington

CALIFORNIA

Zone 3 Dry except

Zone 2

Imperial

Zone 3 Marine

Alameda

Marin

Mendocino

Monterey

Napa

San Benito

San Francisco

San Luis Obispo

San Mateo

Santa Barbara

Santa Clara

Santa Cruz

Sonoma

Ventura

Zone 4 Dry

Amador

Calaveras

El Dorado

Inyo

Lake

Mariposa

Trinity

Tuolumne

Zone 4 Marine

Del Norte

Humboldt

Zone 5

Lassen

Modoc

Nevada

Plumas

Sierra

Siskiyou

Zone 6

Alpine

Mono

COLORADO

Zone 5 except

Zone 4

Baca

Las Animas

Otero

Zone 6

Alamosa

Archuleta

Chaffee

Conejos

Costilla

Custer

Dolores

Eagle

Moffat

Ouray

Rio Blanco

Saguache

San Miguel

Zone 7

Clear Creek

Grand

Gunnison

Hinsdale

Jackson

Lake

Mineral

Park

Pitkin

Rio Grande

Routt

San Juan

Summit

CONNECTICUT

Zone 5

Delaware

Zone 4

DIST OF COLUMBIA

Zone 4

FLORIDA

Zone 2 except

Zone 1

Broward

Dade

Monroe

GEORGIA

Zone 3 except

Zone 2

Appling

Atkinson

Bacon

Baker

Berrien

Brantley

Brooks

Bryan

Camden

Charlton

Chatham

Clinch

Colquitt

Cook

Decatur

Echols

Effingham

Evans

Glynn

Grady

Jeff Davis

Lanier

Liberty

Long

Lowndes

McIntosh

Miller

Mitchell

Pierce

Seminole

Tattnall

Thomas

Toombs

Ware

Wayne

Zone 4

Banks

Catoosa

Chattooga

Dade

Dawson

Fannin

Floyd

Franklin

Gilmer

Gordon

Habersham

Hall

Lumpkin

Murray

Pickens

Rabun

Stephens

Towns

Union

Walker

White

Whitfield

HAWAII

Zone 1 Moist

IDAHO

Zone 6 except

Zone 5

Ada

Benewah

Canyon

Cassia

Clearwater

Elmore

Gem

Gooding

Idaho

Jerome

Kootenai

Latah

Lewis

Lincoln

Minidoka

Nez Perce

Owyhee

Payette

Power

Shoshone

Twin Falls

Washington

ILLINOIS

Zone 5 except

Zone 4

Alexander

Bond

Christian

Clay

Clinton

Crawford

Edwards

Effingham

Fayette

Franklin

Gallatin

Hamilton

Hardin

Jackson

Jasper

Jefferson

Johnson

Lawrence

Macoupin

Madison

Marion

Massac

Monroe

Montgomery

Perry

Pope

Pulaski

Randolph

Richland

Saline

Shelby

(continued)

TABLE 301.1—continued
CLIMATE ZONES BY STATE, COUNTY AND TERRITORIES

St Clair
Union
Wabash
Washington
Wayne
White
Williamson

INDIANA

Zone 5 except

Zone 4
Brown
Clark
Crawford
Daviess
Dearborn
Dubois
Floyd
Gibson
Greene
Harrison
Jackson
Jefferson
Jennings
Knox
Lawrence
Martin
Monroe
Ohio
Orange
Perry
Pike
Posey
Ripley
Scott
Spencer
Sullivan
Switzerland
Vanderburgh
Warrick
Washington

IOWA

Zone 5 except

Zone 6
Allamakee
Black Hawk
Bremer
Buchanan
Buena Vista
Butler
Calhoun
Cerro Gordo
Cherokee
Chickasaw
Clay
Clayton
Delaware
Dickinson
Emmet
Fayette
Floyd
Franklin
Grundy
Hamilton
Hancock
Hardin
Howard
Humboldt
Ida
Kossuth
Lyon
Mitchell
O'Brien
Osceola
Palo Alto
Plymouth
Pocahontas
Sac
Sioux
Webster
Winnebago
Winneshiek
Worth
Wright

KANSAS

Zone 4 except

Zone 5
Cheyenne
Cloud
Decatur
Ellis
Gove
Graham
Greeley
Hamilton
Jewell
Lane
Logan
Mitchell
Ness
Norton
Osborne
Phillips
Rawlins
Republic
Rooks
Scott
Sheridan
Sherman
Smith
Thomas
Trego
Wallace
Wichita

KENTUCKY

Zone 4

LOUISIANA

Zone 2 except

Zone 3
Bienville
Bossier
Caddo
Caldwell
Catahoula
Claiborne
Concordia
De Soto
East Carroll
Franklin
Grant
Jackson
La Salle
Lincoln
Madison
Morehouse
Natchitoches
Ouachita
Red River
Richland
Sabine
Tensas
Union
Vernon
Webster
West Carroll
Winn

MAINE

Zone 6 except

Zone 7
Aroostook

MARYLAND

Zone 4 except

Zone 5
Garrett

MASSACHUSETTS

Zone 5

MICHIGAN

Zone 5 except

Zone 6
Alcona
Alger
Alpena
Antrim
Arenac
Benzie
Charlevoix
Cheboygan
Clare
Crawford
Delta
Dickinson
Emmet
Gladwin
Grand Traverse
Huron
Iosco
Isabella
Kalkaska
Lake
Leelanau
Manistee
Marquette
Mason
Mecosta
Menominee
Missaukee
Montmorency
Newaygo
Oceana
Ogemaw
Osceola
Oscoda
Otsego
Presque Isle
Roscommon
Sanilac
Wexford

Zone 7
Baraga
Chippewa
Gogebic
Houghton
Iron
Keweenaw
Luce
Mackinac
Ontonagon
Schoolcraft

MINNESOTA

Zone 6 except

Zone 7
Aitkin
Becker
Beltrami
Carlton
Cass
Clay
Clearwater
Cook
Crow Wing
Grant
Hubbard
Itasca
Kanabec
Kittson
Koochiching
Lake Of The Woods
Mahnomen
Marshall
Mille Lacs
Norman
Otter Tail
Pennington
Pine
Polk
Red Lake
Roseau
St Louis
Wadena
Wilkin

MISSISSIPPI

Zone 3 except

Zone 2
Hancock
Harrison
Jackson
Pearl River
Stone

MISSOURI

Zone 4 except

Zone 5
Adair
Andrew
Atchison
Buchanan
Caldwell
Chariton
Clark
Clinton
Daviess
De Kalb
Gentry
Grundy

(continued)

TABLE 301.1—continued
CLIMATE ZONES BY STATE, COUNTY AND TERRITORIES

Harrison
Holt
Knox
Lewis
Linn
Livingston
Macon
Marion
Mercer
Nodaway
Pike
Putnam
Ralls
Schuyler
Scotland
Shelby
Sullivan
Worth

MONTANA
Zone 6

NEBRASKA
Zone 5

NEVADA
Zone 5 except
Zone 3
Clark

NEW HAMPSHIRE
Zone 6 except
Zone 5
Cheshire
Hillsborough
Rockingham
Strafford

NEW JERSEY
Zone 4 except
Zone 5
Bergen
Hunterdon
Mercer
Morris
Passaic
Somerset
Sussex
Warren

NEW MEXICO
Zone 4 except
Zone 3
Chaves
Dona Ana
Eddy
Hidalgo
Lea
Luna
Otero
Zone 5
Catron
Colfax
Harding
Los Alamos
McKinley
Mora
Rio Arriba
San Juan
San Miguel
Sandoval
Santa Fe
Taos
Torrance

NEW YORK
Zone 5 except
Zone 4
Bronx
Kings
Nassau
New York
Queens
Richmond
Suffolk
Westchester
Zone 6
Allegany
Broome
Cattaraugus
Chenango
Clinton
Delaware
Essex
Franklin
Fulton
Hamilton
Herkimer
Jefferson
Lewis
Madison
Montgomery
Oneida
Otsego
Schoharie
Schuyler
St Lawrence
Steuben
Sullivan
Tompkins
Ulster
Warren
Wyoming

NORTH CAROLINA
Zone 3 except
Zone 4
Alamance
Alexander
Bertie
Buncombe
Burke
Caldwell
Caswell
Catawba
Chatham
Cherokee
Clay
Cleveland
Davie
Durham
Forsyth
Franklin
Gates
Graham
Granville
Guilford
Halifax
Harnett
Haywood
Henderson
Hertford
Iredell
Jackson
Lee
Lincoln
Macon
Madison
McDowell
Nash
Northampton
Orange
Person
Polk
Rockingham
Rutherford
Stokes
Surry
Swain
Transylvania
Vance
Wake
Warren
Wilkes
Yadkin
Zone 5
Alleghany
Ashe
Avery
Mitchell
Watauga
Yancey

NORTH DAKOTA
Zone 7 except
Zone 6
Adams
Billings
Bowman
Burleigh
Dickey
Dunn
Emmons
Golden Valley
Grant
Hettinger
La Moure
Logan
McIntosh
McKenzie
Mercer
Morton
Oliver
Ransom
Richland
Sargent
Sioux
Slope
Stark

OHIO
Zone 5 except
Zone 4
Adams
Brown
Clermont
Gallia
Hamilton
Lawrence
Pike
Scioto
Washington

OKLAHOMA
Zone 3 Moist except
Zone 4 Dry
Beaver
Cimarron
Texas

OREGON
Zone 4 Marine except
Zone 5 Dry
Baker
Crook
Deschutes
Gilliam
Grant
Harney
Hood River
Jefferson
Klamath
Lake
Malheur
Morrow
Sherman
Umatilla
Union
Wallowa
Wasco
Wheeler

PENNSYLVANIA
Zone 5 except
Zone 4
Bucks
Chester
Delaware
Montgomery
Philadelphia
York
Zone 6
Cameron
Clearfield
Elk
McKean
Potter
Susquehanna
Tioga
Wayne

RHODE ISLAND
Zone 5

SOUTH CAROLINA
Zone 3

SOUTH DAKOTA
Zone 6 except
Zone 5
Bennett

(continued)

TABLE 301.1—continued
CLIMATE ZONES BY STATE, COUNTY AND TERRITORIES

Bon Homme
Charles Mix
Clay
Douglas
Gregory
Hutchinson
Jackson
Mellette
Todd
Tripp
Union
Yankton

TENNESSEE

Zone 4 except

Zone 3
Chester
Crockett
Dyer
Fayette
Hardeman
Hardin
Haywood
Henderson
Lake
Lauderdale
Madison
McNairy
Shelby
Tipton

TEXAS

Zone 2 Moist except

Zone 2 Dry
Bandera
Dimmit
Edwards
Frio
Kinney
La Salle
Maverick
Medina
Real
Uvalde
Val Verde
Webb
Zapata
Zavala

Zone 3 Dry
Andrews
Baylor
Borden
Brewster
Callahan
Childress
Coke
Coleman
Collingsworth
Concho
Cottle
Crane
Crockett
Crosby
Culberson
Dawson
Dickens
Ector
El Paso
Fisher
Foard
Gaines
Garza
Glasscock
Hall
Hardeman
Haskell
Hemphill
Howard
Hudspeth
Irion
Jeff Davis
Jones
Kent
Kerr
Kimble
King
Knox
Loving
Lubbock
Lynn
Martin
Mason
Mcculloch
Menard
Midland
Mitchell
Motley
Nolan
Pecos
Presidio
Reagan
Reeves
Runnels
Schleicher
Scurry
Shackelford
Sterling
Stonewall
Sutton
Taylor
Terrell
Terry
Throckmorton
Tom Green
Upton
Ward
Wheeler
Wilbarger
Winkler

Zone 3 Moist
Archer
Blanco
Bowie
Brown
Burnet
Camp
Cass
Clay
Collin
Comanche
Cooke
Dallas
Delta
Denton
Eastland
Ellis
Erath
Fannin
Franklin
Gillespie
Grayson
Gregg
Hamilton
Harrison
Henderson
Hood
Hopkins
Hunt
Jack
Johnson
Kaufman
Kendall
Lamar
Lampasas
Llano
Marion
Mills
Montague
Morris
Nacogdoches
Navarro
Palo Pinto
Panola
Parker
Rains
Red River
Rockwall
Rusk
Sabine
San Augustine
San Saba
Shelby
Smith
Somervell
Stephens
Tarrant
Titus
Upshur
Van Zandt
Wichita
Wise
Wood
Young

Zone 4
Armstrong
Bailey
Briscoe
Carson
Castro
Cochran
Dallam
Deaf Smith
Donley
Floyd
Gray
Hale
Hansford
Hartley
Hockley
Hutchinson
Lamb
Lipscomb
Moore
Ochiltree
Oldham
Parmer
Potter
Randall
Roberts
Sherman
Swisher
Yoakum

UTAH

Zone 5 except

Zone 3
Washington

Zone 6
Box Elder
Cache
Carbon
Daggett
Duchesne
Morgan
Rich
Summit
Uintah
Wasatch

VERMONT

Zone 6

VIRGINIA

Zone 4

WASHINGTON

Zone 4 Marine except

Zone 5 Dry
Adams
Asotin
Benton
Chelan
Columbia
Douglas
Franklin
Garfield
Grant
Kittitas
Klickitat
Lincoln
Skamania
Spokane
Walla Walla
Whitman
Yakima

Zone 6 Dry
Ferry
Okanogan
Pend Oreille
Stevens

WEST VIRGINIA

Zone 5 except

Zone 4
Berkeley
Boone
Braxton
Cabell
Calhoun
Clay
Gilmer
Jackson
Jefferson
Kanawha

(continued)

TABLE 301.1—continued
CLIMATE ZONES BY STATE, COUNTY AND TERRITORIES

Lincoln
Logan
Mason
McDowell
Mercer
Mingo
Monroe
Morgan
Pleasants
Putnam
Ritchie
Roane
Tyler
Wayne
Wirt
Wood
Wyoming

WISCONSIN

Zone 6 except

Zone 7
Ashland
Bayfield
Burnett
Douglas
Florence
Forest
Iron
Langlade
Lincoln
Oneida
Price
Sawyer
Taylor
Vilas
Washburn

WYOMING

Zone 6 except

Zone 5
Goshen
Platte

Zone 7
Lincoln
Sublette
Teto

TERRITORIES

AMERICAN SAMOA

Zone 1 Moist

GUAM

Zone 1 Moist

NORTHERN MARIANAS

Zone 1 Moist

PUERTO RICO

Zone 1 Moist

U.S. VIRGIN ISLANDS

Zone 1 Moist

TABLE 301.2
WARM HUMID COUNTIES AND TERRITORIES

ALABAMA
Autauga
Baldwin
Barbour
Bullock
Butler
Choctaw
Clarke
Coffee
Conecuh
Covington
Crenshaw
Dale
Dallas
Elmore
Escambia
Geneva
Henry
Houston
Lowndes
Macon
Marengo
Mobile
Monroe
Montgomery
Perry
Pike
Russell
Washington
Wilcox

ARKANSAS
Columbia
Hempstead
Lafayette
Little River
Miller
Sevier
Union

FLORIDA
All

GEORGIA
All in Zone 2 Plus
Ben Hill
Bleckley
Bulloch
Calhoun
Candler
Chattahoochee
Clay
Coffee
Crisp
Dodge
Dooly
Dougherty
Early
Emanuel
Houston
Irwin
Jenkins
Johnson
Laurens
Lee
Macon
Marion
Montgomery
Peach
Pulaski
Quitman
Randolph
Schley
Screven
Stewart
Sumter
Taylor
Telfair
Terrell
Tift
Treutlen
Turner
Twiggs
Webster
Wheeler
Wilcox
Worth

HAWAII
All

LOUISIANA
All in Zone 2 Plus
Bienville
Bossier
Caddo
Caldwell
Catahoula
Claiborne
Concordia
De Soto
Franklin
Grant
Jackson
La Salle
Lincoln
Madison
Natchitoches
Ouachita
Red River
Richland
Sabine
Tensas
Union
Vernon
Webster
Winn

MISSISSIPPI
All in Zone 2 Plus
Adams
Amite
Claiborne
Copiah
Covington
Forrest
Franklin
George
Greene
Hinds
Jefferson
Jefferson Davis
Jones
Lamar
Lawrence
Lincoln
Marion
Perry
Pike
Rankin
Simpson
Smith
Walthall
Warren
Wayne
Wilkinson

NORTH CAROLINA
Brunswick
Carteret
Columbus
New Hanover
Onslow
Pender

SOUTH CAROLINA
Allendale
Bamberg
Barnwell
Beaufort
Berkeley
Charleston
Colleton
Dorchester
Georgetown
Hampton
Horry
Jasper

TEXAS
All in Zone 2 Plus
Blanco
Bowie
Brown
Burnet
Camp
Cass
Collin
Comanche
Dallas
Delta
Denton
Ellis
Erath
Franklin
Gillespie
Gregg
Hamilton
Harrison
Henderson
Hood
Hopkins
Hunt
Johnson
Kaufman
Kendall
Lamar
Lampasas
Llano
Marion
Mills
Morris
Nacogdoches
Navarro
Palo Pinto
Panola
Parker
Rains
Red River
Rockwall
Rusk
Sabine
San Augustine
San Saba
Shelby
Smith
Somervell
Tarrant
Titus
Upshur
Van Zandt
Wood

TERRITORIES

AMERICAN SAMOA
All

GUAM
All

NORTHERN MARIANAS
All

PUERTO RICO
All

U.S. VIRGIN ISLANDS
All

TABLE 301.3(1)
INTERNATIONAL CLIMATE ZONE DEFINITIONS

MAJOR CLIMATE TYPE DEFINITIONS
Marine (C) Definition - Locations meeting all four criteria: 1. Mean temperature of coldest month between -3°C (27°F) and 18°C (65°F) 2. Warmest month mean < 22°C (72°F) 3. At least four months with mean temperatures over 10°C (50°F) 4. Dry season in summer. The month with the heaviest precipitation in the cold season has at least three times as much precipitation as the month with the least precipitation in the rest of the year. The cold season is October through March in the Northern Hemisphere and April through September in the Southern Hemisphere.
Dry (B) Definition - Locations meeting the following criteria: Not Marine and $P_{in} < 0.44 \times (TF - 19.5)$ $[P_{cm} < 2.0 \times (TC + 7)$ in SI units] where: P_{in} = Annual precipitation in inches (cm) T = Annual mean temperature in °F (°C)
Moist (A) Definition - Locations that are not Marine and not Dry.

For SI: °C = [(°F)-32]/1.8; 1 inch = 2.54 cm.

TABLE 301.3(2)
INTERNATIONAL CLIMATE ZONE DEFINITIONS

ZONE NUMBER	THERMAL CRITERIA	
	IP Units	SI Units
1	9000 < CDD50°F	5000 < CDD10°C
2	6300 < CDD50°F ≤ 9000	3500 < CDD10°C ≤ 5000
3A and 3B	4500 < CDD50°F ≤ 6300 AND HDD65°F ≤ 5400	2500 < CDD10°C ≤ 3500 AND HDD18°C ≤ 3000
4A and 4B	CDD50°F ≤ 4500 AND HDD65°F ≤ 5400	CDD10°C ≤ 2500 AND HDD18°C ≤ 3000
3C	HDD65°F ≤ 3600	HDD18°C ≤ 2000
4C	3600 < HDD65°F ≤ 5400	2000 < HDD18°C ≤ 3000
5	5400 < HDD65°F ≤ 7200	3000 < HDD18°C ≤4000
6	7200 < HDD65°F ≤ 9000	4000 < HDD18°C ≤ 5000
7	9000 < HDD65°F ≤ 12600	5000 < HDD18°C ≤ 7000
8	12600 < HDD65°F	7000 < HDD18 °C

For SI: °C = [(°F)-32]/1.8

SECTION 302
DESIGN CONDITIONS

302.1 Interior design conditions. The interior design temperatures used for heating and cooling load calculations shall be a maximum of 72°F (22°C) for heating and minimum of 75°F (24°C) for cooling.

CHAPTER 4

RESIDENTIAL ENERGY EFFICIENCY

This chapter has been revised in its entirety; there will be no marginal markings.

SECTION 401
GENERAL

401.1 Scope. This chapter applies to residential buildings.

401.2 Compliance. Projects shall comply with Sections 401, 402.4, 402.5, 402.6 and 403 (referred to as the mandatory provisions) and either:

1. Sections 402.1 through 402.3 (prescriptive); or
2. Section 404 (performance).

401.3 Certificate. A permanent certificate shall be posted on or in the electrical distribution panel. The certificate shall be completed by the builder or registered design professional. The certificate shall list the predominant *R*-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawlspace wall and/or floor) and ducts outside conditioned spaces; *U*-factors for fenestration; and the solar heat gain coefficient (SHGC) of fenestration. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the type and efficiency of heating, cooling and service water heating equipment.

SECTION 402
BUILDING THERMAL ENVELOPE

402.1 General. (Prescriptive).

402.1.1 Insulation and fenestration criteria. The building thermal envelope shall meet the requirements of Table 402.1.1 based on the climate zone specified in Chapter 3.

402.1.2 *R*-value computation. Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to compute the component *R*-value. The manufacturer's settled *R*-value shall be used for blown insulation. Computed *R*-values shall not include an *R*-value for other building materials or air films.

402.1.3 *U*-factor alternative. An assembly with a *U*-factor equal to or less than that specified in Table 402.1.3 shall be permitted as an alternative to the *R*-value in Table 402.1.1.

Exception: For mass walls not meeting the criterion for insulation location in Section 402.2.3, the *U*-factor shall be permitted to be:

1. *U*-factor of 0.17 in Climate Zone 1.
2. *U*-factor of 0.14 in Climate Zone 2.
3. *U*-factor of 0.12 in Climate Zone 3.

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	1.20	0.75	0.40	30	13	3	13	0	0	0
2	0.75	0.75	0.40	30	13	4	13	0	0	0
3	0.65	0.65	0.40[e]	30	13	5	19	0	0	5 / 13
4 except Marine	0.40	0.60	NR	38	13	5	19	10 / 13	10, 2 ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	19 or 13+5[g]	13	30[f]	10 / 13	10, 2 ft	10 / 13
6	0.35	0.60	NR	49	19 or 13+5[g]	15	30[f]	10 / 13	10, 4 ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	19	30[f]	10 / 13	10, 4 ft	10 / 13

For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. R-19 shall be permitted to be compressed into a 2 × 6 cavity.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

c. The first *R*-value applies to continuous insulation, the second to framing cavity insulation; either insulation meets the requirement.

d. R-5 shall be added to the required slab edge *R*-values for heated slabs.

e. There are no SHGC requirements in the Marine zone.

f. Or insulation sufficient to fill the framing cavity, R-19 minimum.

g. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.

TABLE 402.1.3
EQUIVALENT *U*-FACTORS[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR	SKYLIGHT *U*-FACTOR	CEILING *U*-FACTOR	FRAME WALL *U*-FACTOR	MASS WALL *U*-FACTOR	FLOOR *U*-FACTOR	BASEMENT WALL *U*-FACTOR	CRAWL SPACE WALL *U*-FACTOR
1	1.2	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.75	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.65	0.65	0.035	0.082	0.141	0.047	0.360	0.136
4 except Marine	0.40	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.060	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.060	0.06	0.033	0.059	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.033	0.059	0.065

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

402.1.4 Total UA alternative. If the total building thermal envelope UA (sum of *U*-factor times assembly area) is less than or equal to the total UA resulting from using the *U*-factors in Table 402.1.3 (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table 402.1.1. The UA calculation shall be done using a method consistent with the ASHRAE *Handbook of Fundamentals* and shall include the thermal bridging effects of framing materials. The SHGC requirements shall be met in addition to UA compliance.

402.2 Specific insulation requirements. (Prescriptive).

402.2.1 Ceilings with attic spaces. When Section 402.1.1 would require R-38 in the ceiling, R-30 shall be deemed to satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Similarly R-38 shall be deemed to satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves.

402.2.2 Ceilings without attic spaces. Where Section 402.1.1 would require insulation levels above R-30 and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation for such roof/ceiling assemblies shall be R-30. This reduction of insulation from the requirements of Section 402.1.1 shall be limited to 500 square feet (46 m^2) of ceiling area.

402.2.3 Mass walls. Mass walls for the purposes of this Chapter shall be considered walls of concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth (adobe, compressed earth block, rammed earth) and solid timber/logs. The provisions of Section 402.1.1 for mass walls shall be applicable when at least 50 percent of the required insulation *R*-value is on the exterior of, or integral to, the wall. Walls that do not meet this criterion for insulation placement shall meet the wood frame wall insulation requirements of Section 402.1.1.

Exception: For walls that do not meet the criterion for insulation placement, the minimum added insulation *R*-value shall be permitted to be:

1. *R*-value of 4 in Climate Zone 1.
2. *R*-value of 6 in Climate Zone 2.
3. *R*-value of 8 in Climate Zone 3.

402.2.4 Steel-frame ceilings, walls and floors. Steel-frame ceilings, walls and floors shall meet the insulation requirements of Table 402.2.4 or shall meet the *U*-factor requirements in Table 402.1.3. The calculation of the *U*-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

TABLE 402.2.4
STEEL-FRAME CEILING, WALL AND FLOOR INSULATION (*R*-VALUE)

WOOD FRAME *R*-VALUE REQUIREMENT	COLD-FORMED STEEL EQUIVALENT *R*-VALUE[a]
Steel Truss Ceilings[b]	
R-30	R - 38 or R - 30 + 3 or R - 26 + 5
R-38	R - 49 or R - 38 + 3
R-49	R-38+5
Steel Joist Ceilings[b]	
R-30	R - 38 in 2×4 or 2×6 or 2×8 R - 49 in any framing
R-38	R - 49 in 2×4 or 2×6 or 2×8 or 2×10
Steel Framed Wall	
R-13	R - 13 + 5 or R - 15 + 4 or R - 21 + 3
R-19	R - 13 + 9 or R - 19 + 8 or R - 25 + 7
R-21	R - 13 + 10 or R - 19 + 9 or R - 25 + 8
Steel Joist Floor	
R-13	R - 19 in 2×6 R - 19 + 6 in 2×8 or 2×10
R-19	R - 19 + 6 in 2×6 R - 19 + 12 in 2×8 or 2×10

a. Cavity insulation *R*-value is listed first, followed by continuous insulation *R*-value.
b. Insulation exceeding the height of the framing shall cover the framing.

402.2.5 Floors. Floor insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

402.2.6 Basement walls. Walls associated with conditioned basements shall be insulated from the top of the basement wall down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. Walls associated with unconditioned basements shall meet this requirement unless the floor overhead is insulated in accordance with Sections 402.1.1 and 402.2.5.

402.2.7 Slab-on-grade floors. Slab-on-grade floors with a floor surface less than 12 inches (305 mm) below grade shall be insulated in accordance with Table 402.1.1. The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table 402.1.1 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil. The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall. Slab-edge insulation is not required in jurisdictions designated by the code official as having a very heavy termite infestation.

402.2.8 Crawl space walls. As an alternative to insulating floors over crawl spaces, crawl space walls shall be permitted to be insulated when the crawl space is not vented to the outside. Crawl space wall insulation shall be permanently fastened to the wall and extend downward from the floor to the finished grade level and then vertically and/or horizontally for at least an additional 24 inches (610 mm). Exposed earth in unvented crawl space foundations shall be covered with a continuous vapor retarder. All joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend at least 6 inches (153 mm) up the stem wall and shall be attached to the stem wall.

402.2.9 Masonry veneer. Insulation shall not be required on the horizontal portion of the foundation that supports a masonry veneer.

402.2.10 Thermally isolated sunroom insulation. The minimum ceiling insulation *R*-values shall be R-19 in zones 1 through 4 and R-24 in zones 5 though 8. The minimum wall *R*-value shall be R-13 in all zones. New wall(s) separating a sunroom from conditioned space shall meet the building thermal envelope requirements.

402.3 Fenestration. (Prescriptive).

402.3.1 *U*-factor. An area-weighted average of fenestration products shall be permitted to satisfy the *U*-factor requirements.

402.3.2 Glazed fenestration SHGC. An area-weighted average of fenestration products more than 50 percent glazed shall be permitted to satisfy the SHGC requirements.

402.3.3 Glazed fenestration exemption. Up to 15 square feet (1.4 m^2) of glazed fenestration per dwelling unit shall be permitted to be exempt from *U*-factor and SHGC requirements in Section 402.1.1.

402.3.4 Opaque door exemption. One opaque door assembly is exempted from the *U*-factor requirement in Section 402.1.1.

402.3.5 Thermally isolated sunroom *U*-factor. For Zones 4 through 8, the maximum fenestration *U*-factor shall be 0.50 and the maximum skylight *U*-factor shall be 0.75. New windows and doors separating the sunroom from conditioned space shall meet the building thermal envelope requirements.

402.3.6 Replacement fenestration. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC in Table 402.1.1.

402.4 Air leakage. (Mandatory).

402.4.1 Building thermal envelope. The building thermal envelope shall be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be caulked, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material:

1. All joints, seams and penetrations.
2. Site-built windows, doors and skylights.
3. Openings between window and door assemblies and their respective jambs and framing.
4. Utility penetrations.
5. Dropped ceilings or chases adjacent to the thermal envelope.
6. Knee walls.
7. Walls and ceilings separating a garage from conditioned spaces.
8. Behind tubs and showers on exterior walls.
9. Common walls between dwelling units.
10. Other sources of infiltration.

402.4.2 Fenestration air leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m^2), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m^2), when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and listed and labeled by the manufacturer.

Exceptions: Site-built windows, skylights and doors.

402.4.3 Recessed lighting. Recessed luminaires installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces by being:

1. IC-rated and labeled with enclosures that are sealed or gasketed to prevent air leakage to the ceiling cavity or unconditioned space; or

2. IC-rated and labeled as meeting ASTM E 283 when tested at 1.57 psi (75 Pa) pressure differential with no more than 2.0 cfm (0.944 L/s) of air movement from the conditioned space to the ceiling cavity; or
3. Located inside an airtight sealed box with clearances of at least 0.5 inch (12.7 mm) from combustible material and 3 inches (76 mm) from insulation.

402.5 Moisture control. (Mandatory). The building design shall not create conditions of accelerated deterioration from moisture condensation. Above-grade frame walls, floors and ceilings not ventilated to allow moisture to escape shall be provided with an approved vapor retarder. The vapor retarder shall be installed on the warm-in-winter side of the thermal insulation.

Exceptions:

1. In construction where moisture or its freezing will not damage the materials.
2. Frame walls, floors and ceilings in jurisdictions in Zones 1, 2, 3, 4A and 4B. (Crawl space floor vapor retarders are not exempted.)
3. Where other approved means to avoid condensation are provided.

402.6 Maximum fenestration *U*-factor and SHGC. (Mandatory). The area weighted average maximum fenestration *U*-factor permitted using trade offs from Section 402.1.4 or Section 404 shall be 0.48 in zones 4 and 5 and 0.40 in zones 6 through 8 for vertical fenestration, and 0.75 in zones 4 through 8 for skylights. The area weighted average maximum fenestration SHGC permitted using trade-offs from Section 404 in Zones 1 through 3 shall be 0.50.

SECTION 403
SYSTEMS (Mandatory)

403.1 Controls. At least one thermostat shall be provided for each separate heating and cooling system.

403.1.1 Heat pump supplementary heat. Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

403.2 Ducts.

403.2.1 Insulation. Supply and return ducts shall be insulated to a minimum of R-8. Ducts in floor trusses shall be insulated to a minimum of R-6.

Exception: Ducts or portions thereof located completely inside the building thermal envelope.

403.2.2 Sealing. All ducts, air handlers, filter boxes, and building cavities used as ducts shall be sealed. Joints and seams shall comply with Section M1601.3.1 of the *International Residential Code*.

403.2.3 Building cavities. Building framing cavities shall not be used as supply ducts.

403.3 Mechanical system piping insulation. Mechanical system piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) shall be insulated to a minimum of R-2.

403.4 Circulating hot water systems. All circulating service hot water piping shall be insulated to at least R-2. Circulating hot water systems shall include an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not in use.

403.5 Mechanical ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

403.6 Equipment sizing. Heating and cooling equipment shall be sized in accordance with Section M1401.3 of the *International Residential Code*.

SECTION 404
SIMULATED PERFORMANCE ALTERNATIVE (Performance)

404.1 Scope. This section establishes criteria for compliance using simulated energy performance analysis. Such analysis shall include heating, cooling, and service water heating energy only.

404.2 Mandatory requirements. Compliance with this Section requires that the criteria of Sections 401, 402.4, 402.5, 402.6 and 403 be met.

404.3 Performance-based compliance. Compliance based on simulated energy performance requires that a proposed residence (proposed design) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the standard reference design. Energy prices shall be taken from a source approved by the code official, such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

Exception: Jurisdictions that require site energy (1kWh = 3,413 Btu) rather than energy cost as the metric of comparison.

404.4 Documentation.

404.4.1 Compliance software tools. Documentation verifying that the methods and accuracy of the compliance software tools conform to the provisions of this section shall be provided to the code official.

404.4.2 Compliance report. Compliance software tools shall generate a report that documents that the proposed design has annual energy costs less than or equal to the annual energy costs of the standard reference design. The compliance documentation shall include the following information:

1. Address of the residence;
2. An inspection checklist documenting the building component characteristics of the proposed design as listed in Table 404.5.2(1). The inspection checklist shall show the estimated annual energy cost for both

the standard reference design and the proposed design;

3. Name of individual completing the compliance report; and
4. Name and version of the compliance software tool.

404.4.3 Additional documentation. The code official shall be permitted to require the following documents:

1. Documentation of the building component characteristics of the standard reference design.
2. A certification signed by the builder providing the building component characteristics of the proposed design as given in Table 404.5.2(1).

404.5 Calculation procedure.

404.5.1 General. Except as specified by this section, the standard reference design and proposed design shall be configured and analyzed using identical methods and techniques.

404.5.2 Residence specifications. The standard reference design and proposed design shall be configured and analyzed as specified by Table 404.5.2(1). Table 404.5.2(1) shall include by reference all notes contained in Table 402.1.1.

404.6 Calculation software tools.

404.6.1 Minimum capabilities. Calculation procedures used to comply with this section shall be software tools capable of calculating the annual energy consumption of all building elements that differ between the standard reference design and the proposed design and shall include the following capabilities:

1. Computer generation of the standard reference design using only the input for the proposed design. The calculation procedure shall not allow the user to directly modify the building component characteristics of the standard reference design.
2. Calculation of whole-building (as a single zone) sizing for the heating and cooling equipment in the standard reference design residence in accordance with Section M1401.3 of the *International Residential Code*.
3. Calculations that account for the effects of indoor and outdoor temperatures and part-load ratios on the performance of heating, ventilating and air conditioning equipment based on climate and equipment sizing.
4. Printed code official inspection checklist listing each of the proposed design component characteristics from Table 404.5.2(1) determined by the analysis to provide compliance, along with their respective performance ratings (e.g. *R*-Value, *U*-Factor, SHGC, HSPF, AFUE, SEER, EF, etc.).

404.6.2 Specific approval. Performance analysis tools meeting the applicable sections of 404 shall be permitted to be approved. Tools are permitted to be approved based on meeting a specified threshold for a jurisdiction. The code official shall be permitted to approve tools for a specified application or limited scope.

404.6.3 Input values. When calculations require input values not specified by Sections 402, 403 and 404, those input values shall be taken from an approved source.

TABLE 404.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: mass wall if proposed wall is mass: otherwise wood frame	As proposed
	Gross area: same as proposed	As proposed
	U-Factor: from Table 402.1.3	As proposed
	Solar absorptance = 0.75	As proposed
	Emittance = 0.90	As proposed
Basement and crawl-space walls	Type: same as proposed	As proposed
	Gross area: same as proposed	As proposed
	U-Factor: from Table 402.1.3 with insulation layer on interior side of walls	As proposed
Above-grade floors	Type: wood frame	As proposed
	Gross area: same as proposed	As proposed
	U-Factor: from Table 402.1.3	As proposed
Ceilings	Type: wood frame	As proposed
	Gross area: same as proposed	As proposed
	U-Factor: from Table 402.1.3	As proposed
Roofs	Type: composition shingle on wood sheathing	As proposed
	Gross area: same as proposed	As proposed
	Solar absorptance = 0.75	As proposed
	Emittance = 0.90	As proposed
Attics	Type: vented with aperture = 1 ft^2 per 300 ft^2 ceiling area	As proposed
Foundations	Type: same as proposed	As proposed
Doors	Area: 40 ft^2	As proposed
	Orientation: North	As proposed
	U-factor: same as fenestration from Table 402.1.3	As proposed
Glazing[a]	Total area[b] =	As proposed
	(a) The proposed glazing area; where the proposed glazing area is less than 18% of the conditioned floor area	
	(b) 18% of the conditioned floor area; where the proposed glazing area is 18% or more of the conditioned floor area	
	Orientation: equally distributed to four cardinal compass orientations (N, E, S, & W)	As proposed
	U-factor: from Table 402.1.3	As proposed
	SHGC: From Table 402.1.1 except that for climates with no requirement (NR) SHGC = 0.40 shall be used	As proposed
	Interior shade fraction:	Same as standard reference design[c]
	Summer (all hours when cooling is required) = 0.70	
	Winter (all hours when heating is required) = 0.85	As proposed
	External shading: none	
Skylights	None	As proposed
Thermally isolated sunrooms	None	As proposed

(continued)

TABLE 404.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS—continued

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	Specific Leakage Area (SLA)[d] = 0.00036 assuming no energy recovery	For residences that are not tested, the same as the standard reference design For residences without mechanical ventilation that are tested in accordance with ASHRAE 119, Section 5.1, the measured air exchange rate[e] but not less than 0.35 ACH For residences with mechanical ventilation that are tested in accordance with ASHRAE 119, Section 5.1, the measured air exchange rate[e] combined with the mechanical ventilation rate,[f] which shall not be less than $0.01 \times CFA + 7.5 \times (N_{br}+1)$ where: CFA = conditioned floor area N_{br} = number of bedrooms
Mechanical ventilation	None, except where mechanical ventilation is specified by the proposed design, in which case: Annual vent fan energy use: kWh/yr = $0.03942 \times CFA + 29.565 \times (N_{br}+1)$ where: CFA = conditioned floor area N_{br} = number of bedrooms	As proposed
Internal gains	IGain = $17{,}900 + 23.8 \times CFA + 4104 \times N_{br}$ (Btu/day per dwelling unit)	Same as standard reference design
Internal mass	An internal mass for furniture and contents of 8 pounds per square foot of floor area	Same as standard reference design, plus any additional mass specifically designed as a thermal storage element[g] but not integral to the building envelope or structure
Structural mass	For masonry floor slabs, 80% of floor area covered by R-2 carpet and pad, and 20% of floor directly exposed to room air For masonry basement walls, as proposed, but with insulation required by Table 402.1.3 located on the interior side of the walls For other walls, for ceilings, floors, and interior walls, wood frame construction	As proposed As proposed As proposed
Heating systems[h, i]	Fuel type: same as proposed design Efficiencies: Electric: air-source heat pump with prevailing federal minimum efficiency Nonelectric furnaces: natural gas furnace with prevailing federal minimum efficiency Nonelectric boilers: natural gas boiler with prevailing federal minimum efficiency Capacity: sized in accordance with Section M1401.3 of the *International Residential Code*	As proposed As proposed As proposed As proposed As proposed
Cooling systems[h, j]	Fuel type: Electric Efficiency: in accordance with prevailing federal minimum standards Capacity: sized in accordance with Section M1401.3 of the *International Residential Code*	As proposed As proposed As proposed

(continued)

TABLE 404.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS—continued

Service Water Heating[h, k]	Fuel type: same as proposed design Efficiency: in accordance with prevailing Federal minimum standards Use: gal/day = 30 + 10 × N_{br} Tank temperature: 120°F	As proposed As proposed Same as standard reference Same as standard reference
Thermal distribution systems	A thermal distribution system efficiency (DSE) of 0.80 shall be applied to both the heating and cooling system efficiencies	Same as standard reference design, except as specified by Table 404.5.2(2)
Thermostat	Type: manual, cooling temperature set point = 78°F; heating temperature set point = 68°F	Same as standard reference design

For SI: 1 square foot = 0.93 m^2; 1 British thermal unit = 1055 J; 1 pound per square foot = 4.88 kg/m^2; 1 gallon (U.S.) = 3.785 L; °C = (°F-32)/1.8.

a. Glazing shall be defined as sunlight-transmitting fenestration, including the area of sash, curbing or other framing elements, that enclose conditioned space. Glazing includes the area of sunlight-transmitting fenestration assemblies in walls bounding conditioned basements. For doors where the sunlight-transmitting opening is less than 50% of the door area, the glazing area is the sunlight transmitting opening area. For all other doors, the glazing area is the rough frame opening area for the door including the door and the frame.

b. For residences with conditioned basements, R-2 and R-4 residences and townhouses, the following formula shall be used to determine glazing area:

$AF = A_s \times FA \times F$

where:

AF = Total glazing area.
A_s = Standard reference design total glazing area.
FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 x below-grade boundary wall area).
F = (Above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

c. For fenestrations facing within 15 degrees (0.26 rad) of true south that are directly coupled to thermal storage mass, the winter interior shade fraction shall be permitted to be increased to 0.95 in the proposed design.

d. Where Leakage Area (L) is defined in accordance with Section 5.1 of ASHRAE 119 and where:

$SLA = L/CFA$

where L and CFA are in the same units.

e. Tested envelope leakage shall be determined and documented by an independent party approved by the code official. Hourly calculations as specified in the 2001 ASHRAE *Handbook of Fundamentals*, Chapter 26, page 26.21, Equation 40 (Sherman-Grimsrud model) or the equivalent shall be used to determine the energy loads resulting from infiltration.

f. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE *Handbook of Fundamentals* page 26.24 and the "Whole-house Ventilation" provisions of 2001 ASHRAE *Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.

g. Thermal Storage Element shall mean a component not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element must be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or must be connected to such a room with pipes or ducts that allow the element to be actively charged.

h. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.

i. For a proposed design without a proposed heating system, a heating system with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design. For electric heating systems, the prevailing federal minimum efficiency air-source heat pump shall be used for the standard reference design.

j. For a proposed design home without a proposed cooling system, an electric air conditioner with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.

k. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater with the prevailing federal minimum Energy Factor for the same fuel as the predominant heating fuel type shall be assumed. For the case of a proposed design without a proposed water heater, a 40-gallon storage-type water heater with the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.

TABLE 404.5.2(2)
DEFAULT DISTRIBUTION SYSTEM EFFICIENCIES FOR PROPOSED DESIGNS[a]

DISTRIBUTION SYSTEM CONFIGURATION AND CONDITION:	FORCED AIR SYSTEMS	HYDRONIC SYSTEMS[b]
Distribution system components located in unconditioned space	0.80	0.95
Distribution systems entirely located in conditioned space[c]	0.88	1.00
Proposed "reduced leakage" with entire air distribution system located in the conditioned space[d]	0.96	—
Proposed "reduced leakage" air distribution system with components located in the unconditioned space	0.88	—
"Ductless" systems[e]	1.00	—

For SI: 1 cubic foot per minute = 0.47 L/s; 1 square foot = 0.093 m^2; 1 pound per square inch = 6895 Pa; 1 inch water gauge = 1250 Pa.

a. Default values given by this table are for untested distribution systems, which must still meet minimum requirements for duct system insulation.

b. Hydronic Systems shall mean those systems that distribute heating and cooling energy directly to individual spaces using liquids pumped through closed loop piping and that do not depend on ducted, forced air flows to maintain space temperatures.

c. Entire system in conditioned space shall mean that no component of the distribution system, including the air handler unit, is located outside of the conditioned space.

d. Proposed "reduced leakage" shall mean leakage to outdoors not greater than 3 cfm per 100 ft^2 of conditioned floor area and total leakage not greater than 9 cfm per 100 ft^2 of conditioned floor area at a pressure differential of 0.02 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Total leakage of not greater than 3 cfm per 100 ft^2 of conditioned floor area at a pressure difference of 0.02 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure, shall be deemed to meet this requirement without measurement of leakage to outdoors. This performance shall be specified as required in the construction documents and confirmed through field-testing of installed systems as documented by an approved independent party.

e. Ductless systems may have forced airflow across a coil but shall not have any ducted airflows external to the manufacturer's air handler enclosure.

CHAPTER 5
COMMERCIAL ENERGY EFFICIENCY

This chapter has been reformatted; some deletions are not marked.

SECTION 501
GENERAL

501.1 Scope. The requirements contained in this chapter are applicable to commercial buildings, or portions of commercial buildings. These commercial buildings shall meet either the requirements of ASHRAE/IESNA Standard 90.1, *Energy Standard for Buildings Except for Low-Rise Residential Buildings*, or the requirements contained in this chapter.

501.2 Application. The requirements in Sections 502 (Building envelope), 503 (Building mechanical systems), 504 (Service water heating) and 505 (Lighting) shall each be satisfied on an individual basis. Where one or more of these sections is not satisfied, compliance for that section(s) shall be demonstrated in accordance with the applicable provisions of ASHRAE/IESNA 90.1.

Exception: Buildings conforming to Section 506, provided Sections 502.4, 502.5, 503.2, 504, 505.2, 505.3, 505.4, 505.6 and 505.7 are each satisfied.

SECTION 502
BUILDING ENVELOPE REQUIREMENTS

502.1 General. (Prescriptive).

502.1.1 Insulation and fenestration criteria. The building thermal envelope shall meet the requirements of Tables 502.2(1) and 502.3 based on the climate zone specifed in Chapter 3. Buildings with a vertical fenestration area or skylight area that exceeds that allowed in Table 502.3 shall comply with the building envelope provisions of ASHRAE/IESNA 90.1.

502.2 Specific insulation requirements (Prescriptive). Opaque assemblies shall comply with Table 502.2(1).

502.2.1 Roof assembly. The minimum thermal resistance (*R*-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table 502.2(1), based on construction materials used in the roof assembly.

Exception: Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25.4 mm) or less and where the area weighted *U*-factor is equivalent to the same assembly with the *R*-value specified in Table 502.2(1).

Insulation installed on a suspended ceiling with removable ceiling tiles shall not be considered part of the minimum thermal resistance of the roof insulation.

502.2.2 Classification of walls. Walls associated with the building envelope shall be classified in accordance with Section 502.2.2.1 or 502.2.2.2.

502.2.2.1 Above-grade walls. Above-grade walls are those walls covered by Section 502.2.3 on the exterior of the building and completely above grade or walls that are more than 15 percent above grade.

502.2.2.2 Below-grade walls. Below-grade walls covered by Section 502.2.4 are basement or first-story walls associated with the exterior of the building that are at least 85 percent below grade.

502.2.3 Above-grade walls. The minimum thermal resistance (*R*-value) of the insulating material(s) installed in the wall cavity between the framing members and continuously on the walls shall be as specified in Table 502.2(1), based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table 502.2(1). "Mass walls" shall include walls weighing at least (1) 35 pounds per square foot (170 kg/m^2) of wall surface area or (2) 25 pounds per square foot (120 kg/m^2) of wall surface area if the material weight is not more than 120 pounds per cubic foot (1,900 kg/m^3).

502.2.4 Below-grade walls. The minimum thermal resistance (*R*-value) of the insulating material installed in, or continuously on, the below-grade walls shall be as specified in Table 502.2(1), and shall extend to a depth of 10 feet (3048 mm) below the outside finish ground level, or to the level of the floor, whichever is less.

502.2.5 Floors over outdoor air or unconditioned space. The minimum thermal resistance (*R*-value) of the insulating material installed either between the floor framing or continuously on the floor assembly shall be as specified in Table 502.2(1), based on construction materials used in the floor assembly.

"Mass floors" shall include floors weighing at least (1) 35 pounds per square foot (170 kg/m^2) of floor surface area or (2) 25 pounds per square foot (120 kg/m^2) of floor surface area if the material weight is not more than 12 pounds per cubic foot (1,900 kg/m^3).

502.2.6 Slabs on grade. The minimum thermal resistance (*R*-value) of the insulation around the perimeter of unheated or heated slab-on-grade floors shall be as specified in Table 502.2(1). The insulation shall be placed on the outside of the foundation or on the inside of a foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance as shown in the table or to the top of the footing, whichever is less, or downward to at least the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table.

502.2.7 Opaque doors. Opaque doors (doors having less than 50 percent glass area) shall meet the applicable requirements for doors as specified in Table 502.2(1) and be considered as part of the gross area of above-grade walls that are part of the building envelope.

TABLE 502.2(1)
BUILDING ENVELOPE REQUIREMENTS – OPAQUE ASSEMBLIES

CLIMATE ZONE	1	2	3	4 except Marine	5 and Marine 4	6	7	8
Roofs								
Insulation entirely above deck	R-15 ci	R-15 ci	R-15 ci	R-15 ci	R-20 ci	R-20 ci	R-25 ci	R-25 ci
Metal buildings (with R-5 thermal blocks[a])[b]	R-19 + R-10	R-19	R-19	R-19	R-19	R-19	R-19 + R-10	R-19 + R-10
Attic and other	R-30	R-30	R-30	R-30	R-30	R-30	R-38	R-38
Walls, Above Grade								
Mass	NR	NR	R-5.7 ci[c, e]	R-5.7 ci[c]	R-7.6 ci	R-9.5 ci	R-11.4 ci	R-13.3 ci
Metal building[b]	R-13	R-13	R-13	R-13	R-13 + R-13	R-13 + R-13	R-13 + R-13	R-13 + R-13
Metal framed	R-13	R-13	R-13	R-13	R-13 + R-3.8 ci	R-13 + R-3.8 ci	R-13 + R-7.5 ci	R-13 + R-7.5 ci
Wood framed and other	R-13	R-13	R-13	R-13	R-13	R-13	R-13	R-13 + R-7.5 ci
Walls, Below Grade								
Below grade wall[d]	NR	NR	NR	NR	NR	NR	R-7.5 ci	R-7.5 ci
Floors								
Mass	NR	R-5 ci	R-5 ci	R-10 ci	R-10 ci	R-10 ci	R-15 ci	R-15 ci
Joist/Framing	NR	R-19	R-19	R-19	R-19	R-30	R-30	R-30
Slab-on-Grade Floors								
Unheated slabs	NR	NR	NR	NR	NR	NR	NR	R-10 for 24 in. below
Heated slabs	R-7.5 for 12 in. below	R-7.5 for 12 in. below	R-7.5 for 12 in. below	R-7.5 for 12 in. below	R-7.5 for 24 in. below	R-10 for 36 in. below	R-10 for 36 in. below	R-10 for 48 in. below
Opaque Doors								
Swinging	U – 0.70	U – 0.70	U – 0.70	U – 0.70	U – 0.70	U – 0.70	U – 0.70	U – 0.50
Roll-up or sliding	U – 1.45	U – 1.45	U – 1.45	U – 1.45	U – 1.45	U – 0.50	U – 0.50	U – 0.50

For SI: 1 inch = 25.4 mm.
ci – Continuous Insulation
NR – No Requirement

a. Thermal blocks are a minimum R-5 of rigid insulation, which extends 1-inch beyond the width of the purlin on each side, perpendicular to the purlin.
b. Assembly descriptions can be found in Table 502.2(2).
c. R-5.7 ci may be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 in. or less on center vertically and 48 in. or less on center horizontally, with ungrouted cores filled with material having a maximum thermal conductivity of 0.44 Btu-in./h-f^2 F.
d. When heated slabs are placed below grade, below grade walls must meet the exterior insulation requirements for perimeter insulation according to the heated slab-on-grade construction.
e. Insulation is not required for mass walls in Climate Zone 3A located below the "Warm-Humid" line, and in Zone 3B.

TABLE 502.2(2)
METAL BUILDING ASSEMBLY DESCRIPTIONS

ROOFS	DESCRIPTION	REFERENCE
R-19 + R-10	Filled cavity roof. Thermal blocks are a minimum, R-5 of rigid insulation, which extends 1 in. beyond the width of the purlin on each side, perpendicular to the purlin. This construction is R-10 insulation batts draped perpendicularly over the purlins, with enough looseness to allow R-19 batt to be laid above it, parallel to the purlins. Thermal blocks are then placed above the purlin/batt, and the roof deck is secured to the purlins. In the metal building industry, this is known as the "sag and bag" insulation system.	ASHRAE/IESNA 90.1 Table A2.3
R-19	Standing seam with single insulation layer. Thermal blocks are a minimum R-5 of rigid insulation, which extends 1 in. beyond the width of the purlin on each side, perpendicular to the purlin. This construction R-19 insulation batts draped perpendicularly over the purlins. Thermal blocks are then placed above the purlin/batt, and the roof deck is secured to the purlins.	ASHRAE/IESNA 90.1 Table A2.3
Walls		
R-13	Single insulation layer The first layer of R-13 insulation batts is installed continuously perpendicular to the girts and is compressed as the metal skin is attached to the girts.	ASHRAE/IESNA 90.1 Table A3.2
R-13 + R-13	Double insulation layer The first layer of R-13 insulation batts is installed continuously perpendicular to the girts, and is compressed as the metal skin is attached to the girts. The second layer of R-13 insulation batts is installed within the framing cavity.	ASHRAE/IESNA 90.1 Table A3.2

For SI: 1 inch = 25.4 mm.

502.3 Fenestration. (Prescriptive). Fenestration shall comply with Table 502.3.

502.3.1 Maximum area. The vertical fenestration area (not including opaque doors) shall not exceed the percentage of the gross wall area specified in Table 502.3. The skylight area shall not exceed the percentage of the gross roof area specified in Table 502.3.

502.3.2 Maximum *U*-factor and SHGC. For vertical fenestration, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table 502.3, based on the window projection factor. For skylights, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table 502.3.

The window projection factor shall be determined in accordance with Equation 5-1.

$$PF = A/B \qquad \textbf{(Equation 5-1)}$$

where:

PF = Projection factor (decimal).

A = Distance measured horizontally from the furthest continuous extremity of any overhang, eave, or permanently attached shading device to the vertical surface of the glazing.

B = Distance measured vertically from the bottom of the glazing to the underside of the overhang, eave, or permanently attached shading device.

Where different windows or glass doors have different PF values, they shall each be evaluated separately, or an area-weighted PF value shall be calculated and used for all windows and glass doors.

502.4 Air leakage. (Mandatory).

502.4.1 Window and door assemblies. The air leakage of window and sliding or swinging door assemblies that are part of the building envelope shall be determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, or NFRC 400 by an accredited, independent laboratory, and labeled and certified by the manufacturer and shall not exceed the values in Section 402.4.2.

Exception: Site-constructed windows and doors that are weatherstripped or sealed in accordance with Section 502.4.3.

502.4.2 Curtain wall, storefront glazing and commercial entrance doors. Curtain wall, storefront glazing and commercial-glazed swinging entrance doors and revolving doors shall be tested for air leakage at 1.57 pounds per square foot (psf) (75 Pa) in accordance with ASTM E 283.

TABLE 502.3
BUILDING ENVELOPE REQUIREMENTS: FENESTRATION

CLIMATE ZONE	1	2	3	4 except Marine	5 and Marine 4	6	7	8
Vertical Fenestration (40% maximum of above-grade wall)								
***U*-Factor**								
Framing materials other than metal with or without metal reinforcement or cladding								
U-Factor	1.20	0.75	0.65	0.40	0.35	0.35	0.35	0.35
Metal framing with or without thermal break								
Curtain Wall/Storefront *U*-Factor	1.20	0.70	0.60	0.50	0.45	0.45	0.45	0.45
Entrance Door *U*-Factor	1.20	1.10	0.90	0.85	0.80	0.80	0.80	0.80
All Other *U*-Factor[a]	1.20	0.75	0.65	0.55	0.55	0.55	0.50	0.50
SHGC-All Frame Types								
SHGC: PF < 0.25	0.25	0.25	0.25	0.40	0.40	0.40	NR	NR
SHGC: 0.25 ≤ PF < 0.5	0.33	0.33	0.33	NR	NR	NR	NR	NR
SHGC: PF ≥ 0.5	0.40	0.40	0.40	NR	NR	NR	NR	NR
Skylights (3% maximum)								
Glass								
U-Factor	1.60	1.05	0.90	0.60	0.60	0.60	0.60	0.60
SHGC	0.40	0.40	0.40	0.40	0.40	0.40	NR	NR
Plastic								
U-Factor	1.90	1.90	1.30	1.30	1.30	0.90	0.90	0.60
SHGC	0.35	0.35	0.35	0.62	0.62	0.62	NR	NR

NR = No requirement.

PF = Projection factor (See Section 502.3.2)

a. All others includes operable windows, fixed windows and non-entrance doors.

For curtain walls and storefront glazing, the maximum air leakage rate shall be 0.3 cubic foot per minute per square foot (cfm/ft^2) (5.5 m^3/h × m^2) of fenestration area. For commercial glazed swinging entrance doors and revolving doors, the maximum air leakage rate shall be 1.00 cfm/ft^2 (18.3 m^3/h × m^2) of door area when tested in accordance with ASTM E 283.

502.4.3 Sealing of the building envelope. Openings and penetrations in the building envelope shall be sealed with caulking materials or closed with gasketing systems compatible with the construction materials and location. Joints and seams shall be sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material. Sealing materials spanning joints between construction materials shall allow for expansion and contraction of the construction materials.

502.4.4 Outdoor air intakes and exhaust openings. Stair and elevator shaft vents and other outdoor air intakes and exhaust openings integral to the building envelope shall be equipped with not less than a Class I motorized, leakage-rated damper with a maximum leakage rate of 4 cfm per square foot (6.8 L/s · C m^2) at 1.0 inch water gauge (w.g.) (1250 Pa) when tested in accordance with AMCA 500D.

Exception: Gravity (nonmotorized) dampers are permitted to be used in buildings less than three stories in height above grade.

502.4.5 Loading dock weatherseals. Cargo doors and loading dock doors shall be equipped with weatherseals to restrict infiltration when vehicles are parked in the doorway.

502.4.6 Vestibules. A door that separates conditioned space from the exterior shall be protected with an enclosed vestibule, with all doors opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time.

Exceptions:

1. Buildings in Climate Zones 1 and 2 as indicated in Figure 301.1 and Table 301.1.
2. Doors not intended to be used as a building entrance door, such as doors to mechanical or electrical equipment rooms.

3. Doors opening directly from a sleeping unit or dwelling unit.
4. Doors that open directly from a space less than 3,000 square feet (298 m^2) in area.
5. Revolving doors.
6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

502.4.7 Recessed luminaires. When installed in the building envelope, recessed luminaires shall meet one of the following requirements:

1. Type IC rated, manufactured with no penetrations between the inside of the recessed fixture and ceiling cavity and sealed or gasketed to prevent air leakage into the unconditioned space.
2. Type IC or non-IC rated, installed inside a sealed box constructed from a minimum 0.5-inch-thick (12.7 mm) gypsum wallboard or constructed from a preformed polymeric vapor barrier, or other air-tight assembly manufactured for this purpose, while maintaining required clearances of not less than 0.5 inch (12.7 mm) from combustible material and not less than 3 inches (76 mm) from insulation material.
3. Type IC rated, in accordance with ASTM E 283 admitting no more than 2.0 cubic feet per minute (cfm) (0.944 L/s) of air movement from the conditioned space to the ceiling cavity. The luminaire shall be tested at 1.57 psf (75 Pa) pressure difference and shall be labeled.

502.5 Moisture control. (Mandatory). All framed walls, floors and ceilings not ventilated to allow moisture to escape shall be provided with an approved vapor retarder having a permeance rating of 1 perm (5.7×10^{-11} kg/Pa · s · m^2) or less, when tested in accordance with the dessicant method using Procedure A of ASTM E 96. The vapor retarder shall be installed on the warm-in-winter side of the insulation.

Exceptions:

1. Buildings located in Climate Zones 1 through 3 as indicated in Figure 301.1 and Table 301.1.
2. In construction where moisture or its freezing will not damage the materials.
3. Where other approved means to avoid condensation in unventilated framed wall, floor, roof and ceiling cavities are provided.

SECTION 503
BUILDING MECHANICAL SYSTEMS

503.1 General. Mechanical systems and equipment serving the building heating, cooling or ventilating needs shall comply with Section 503.2 (referred to as the mandatory provisions) and either:

1. Section 503.3 (Simple systems), or
2. Section 503.4 (Complex systems).

503.2 Provisions applicable to all mechanical systems. (Mandatory).

503.2.1 Calculation of heating and cooling loads. Design loads shall be determined in accordance with the procedures described in the ASHRAE *Fundamentals Handbook*. Heating and cooling loads shall be adjusted to account for load reductions that are achieved when energy recovery systems are utilized in the HVAC system in accordance with the ASHRAE *HVAC Systems and Equipment Handbook*. Alternatively, design loads shall be determined by an approved equivalent computation procedure, using the design parameters specified in Chapter 3.

503.2.2 Equipment and system sizing. Equipment and system sizing. Heating and cooling equipment and systems capacity shall not exceed the loads calculated in accordance with Section 503.2.1. A single piece of equipment providing both heating and cooling must satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.

Exceptions:

1. Required standby equipment and systems provided with controls and devices that allow such systems or equipment to operate automatically only when the primary equipment is not operating.
2. Multiple units of the same equipment type with combined capacities exceeding the design load and provided with controls that have the capability to sequence the operation of each unit based on load.

503.2.3 HVAC equipment performance requirements. Equipment shall meet the minimum efficiency requirements of Tables 503.2.3(1), 503.2.3(2), 503.2.3(3), 503.2.3(4), 503.2.3(5), 503.2.3(6), 503.2.3(7), 503.2.3(8), 503.2.3(9), 503.2.3(10) and 503.2.3(11) when tested and rated in accordance with the applicable test procedure. The efficiency shall be verified through certification under an approved certification program or, if no certification program exists, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements. Where components, such as indoor or outdoor coils, from different manufacturers are used, calculations and supporting data shall be furnished by the designer that demonstrate that the combined efficiency of the specified components meets the requirements herein.

Exception: Equipment listed in Table 503.2.3(7) not designed for operation at ARI Standard test conditions of 44°F (7°C) leaving chilled water temperature and 85°F (29°C) entering condenser water temperature shall have a minimum full load COP and IPLV rating as shown in Tables 503.2.3(8) through 503.2.3(10) as applicable. The table values are only applicable over the following full load design ranges:

Leaving Chilled Water Temperature:	40 to 48°F (4 to 9°C)
Entering Condenser Water Temperature:	75 to 85°F (24 to 29°C)

Condensing Water
Temperature Rise: 5 to 15°F (Δ3 to Δ8°C)

Chillers designed to operate outside of these ranges are not covered by this code.

503.2.4 HVAC system controls. Each heating and cooling system shall be provided with thermostatic controls as required in Section 503.2.4.1, 503.2.4.2, 503.2.4.3, 503.2.4.4, 503.4.1, 503.4.2, 503.4.3 or 503.4.4.

503.2.4.1 Thermostatic controls. The supply of heating and cooling energy to each zone shall be controlled by individual thermostatic controls capable of responding to temperature within the zone. Where humidification or dehumidification or both is provided, at least one humidity control device shall be provided for each humidity control system.

Exception: Independent perimeter systems that are designed to offset only building envelope heat losses or gains or both serving one or more perimeter zones also served by an interior system provided:

1. The perimeter system includes at least one thermostatic control zone for each building exposure having exterior walls facing only one orientation (within +/- 45 degrees) (0.8 rad) for more than 50 contiguous feet (15.2 m); and
2. The perimeter system heating and cooling supply is controlled by a thermostat(s) located within the zone(s) served by the system.

503.2.4.1.1 Heat pump supplementary heat. Heat pumps having supplementary electric resistance heat shall have controls that, except during defrost, prevent supplementary heat operation when the heat pump can meet the heating load.

503.2.4.2 Set point overlap restriction. Where used to control both heating and cooling, zone thermostatic controls shall provide a temperature range or deadband of at least 5°F (2.8°C) within which the supply of heating and cooling energy to the zone is capable of being shut off or reduced to a minimum.

Exception: Thermostats requiring manual changeover between heating and cooling modes.

503.2.4.3 Off-hour controls. Each zone shall be provided with thermostatic setback controls that are controlled by either an automatic time clock or programmable control system.

Exceptions:

1. Zones that will be operated continuously.
2. Zones with a full HVAC load demand not exceeding 6,800 Btu/h (2 kW) and having a readily accessible manual shutoff switch.

TABLE 503.2.3(1)
UNITARY AIR CONDITIONERS AND CONDENSING UNITS, ELECTRICALLY OPERATED, MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY[b]	TEST PROCEDURE[a]
Air conditioners, Air cooled	< 65,000 Btu/h[d]	Split system	10.0 SEER	ARI 210/240
		Single package	9.7 SEER	
	≥ 65,000 Btuh/h and < 135,000 Btu/h	Split system and single package	10.3 EER[c]	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Split system and single package	9.7 EER[c]	ARI 340/360
	≥ 240,000 Btu/h and < 760,000 Btu/h	Split system and single package	9.5 EER[c] 9.7 IPLV[c]	
	≥ 760,000 Btu/h	Split system and single package	9.2 EER[c] 9.4 IPLV[c]	
Air conditioners, Water and evaporatively cooled	< 65,000 Btu/h	Split system and single package	12.1 EER	ARI 210/240
	≥ 65,000 Btu/h and < 135,000 Btu/h	Split system and single package	11.5 EER[c]	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Split system and single package	11.0 EER[c]	ARI 340/360
	≥ 240,000 Btu/h	Split system and single package	11.0 EER[c] 10.3 IPLV[c]	

For SI: 1 British thermal unit per hour = 0.2931 W.

a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

b. IPLVs are only applicable to equipment with capacity modulation.

c. Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat.

d. Single-phase air-cooled air conditioners < 65,000 Btu/h are regulated by the National Appliance Energy Conservation Act of 1987 (NAECA), SEER values are those set by NAECA.

TABLE 503.2.3(2)
UNITARY AND APPLIED HEAT PUMPS, ELECTRICALLY OPERATED, MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY[b]	TEST PROCEDURE[a]
Air cooled (Cooling mode)	< 65,000 Btu/h[d]	Split system	10.0 SEER	ARI 210/240
		Single package	9.7 SEER	
	≥ 65,000 Btu/h and < 135,000 Btu/h	Split system and single package	10.1 EER[c]	
	≥135,000 Btu/h and < 240,000 Btu/h	Split system and single package	9.3 EER[c]	ARI 340/360
	≥ 240,000 Btu/h	Split system and single package	9.0 EER[c] 9.2 IPLV[c]	
Water source (Cooling mode)	< 17,000 Btu/h	86°F entering water	11.2 EER	ARI/ASHRAE-13256-1
	≥ 17,000 Btu/h and < 135,000 Btu/h	86°F entering water	12.0 EER	ARI/ASHRAE-13256-1
Groundwater source (Cooling mode)	< 135,000 Btu/h	59°F entering water	16.2 EER	ARI/ASHRAE-13256-1
Ground source (Cooling mode)	< 135,000 Btu/h	77°F entering water	13.4 EER	ARI/ASHRAE 13256-1
Air cooled (Heating mode)	< 65,000 Btu/h[d] (Cooling capacity)	Split system	6.8 HSPF	ARI 210/240
		Single package	6.6 HSPF	
	≥ 65,000 Btu/h and < 135,000 Btu/h (Cooling capacity)	47°F db/43°F wb outdoor air	3.2 COP	
	≥ 135,000 Btu/h (Cooling capacity)	47°F db/43°F wb outdoor air	3.1 COP	ARI 340/360
Water source (Heating mode)	< 135,000 Btu/h (Cooling capacity)	68°F entering water	4.2 COP	ARI/ASHRAE-13256-1
Groundwater source (Heating mode)	< 135,000 Btu/h (Cooling capacity)	50°F entering water	3.6 COP	ARI/ASHRAE-13256-1
Ground Source (Heating mode)	< 135,000 Btu/h (Cooling capacity)	32°F entering water	3.1 COP	ARI/ASHRAE-13256-1

For SI: °C = [(°F) - 32] / 1.8, 1 British thermal unit per hour = 0.2931 W.
db = dry-bulb temperature, °F; wb = wet-bulb temperature, °F

a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
b. IPLVs and Part load rating conditions are only applicable to equipment with capacity modulation.
c. Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat.
d. Single-phase air-cooled heat pumps < 65,000 Btu/h are regulated by the National Appliance Energy Conservation Act of 1987 (NAECA). SEER and HSPF values are those set by NAECA.

TABLE 503.2.3(3)
PACKAGED TERMINAL AIR CONDITIONERS AND PACKAGED TERMINAL HEAT PUMPS

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY[b]	TEST PROCEDURE[a]
PTAC (Cooling mode) New construction	All capacities	95°F db outdoor air	12.5 - (0.213 · Cap/1000) EER	ARI 310/380
PTAC (Cooling mode) Replacements[c]	All capacities	95°F db outdoor air	10.9 - (0.213 · Cap/1000) EER	
PTHP (Cooling mode) New construction	All capacities	95°F db outdoor air	12.3 - (0.213 · Cap/1000) EER	
PTHP (Cooling mode) Replacements[c]	All capacities	95°F db outdoor air	10.8 - (0.213 · Cap/1000) EER	
PTHP (Heating mode) New construction	All capacities	—	3.2 - (0.026 · Cap/1000) COP	
PTHP (Heating mode) Replacements[c]	All capacities	—	2.9 - (0.026 · Cap/1000) COP	

For SI: °C - [(°F) - 32] / 1.8, 1 British thermal unit per hour - 0.2931 W

db = dry-bulb temperature, °F

wb = wet-bulb temperature, °F

a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

b. Cap means the rated cooling capacity of the product in Btu/h. If the unit's capacity is less than 7,000 Btu/h, use 7,000 Btu/h in the calculation. If the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculation.

c. Replacement units must be factory labeled as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY: NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS." Replacement efficiencies apply only to units with existing sleeves less than 16 inches (406 mm) high and less than 42 inches (1067 mm) wide.

TABLE 503.2.3(4)
WARM AIR FURNACES AND COMBINATION WARM AIR FURNACES/AIR-CONDITIONING UNITS, WARM AIR DUCT FURNACES AND UNIT HEATERS, MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY[d, e]	TEST PROCEDURE[a]
Warm air furnaces, gas fired	< 225,000 Btu/h	—	78% AFUE or 80% E_t[c]	DOE 10 CFR Part 430 or ANSI Z21.47
	≥ 225,000 Btu/h	Maximum capacity[c]	80% E_t[f]	ANSI Z21.47
Warm air furnaces, oil fired	< 225,000 Btu/h	—	78% AFUE or 80% E_t[c]	DOE 10 CFR Part 430 or UL 727
	≥ 225,000 Btu/h	Maximum capacity[b]	81% E_t[g]	UL 727
Warm air duct furnaces, gas fired	All capacities	Maximum capacity[b]	80% E_c	ANSI Z83.8
Warm air unit heaters, gas fired	All capacities	Maximum capacity[b]	80% E_c	ANSI Z83.8
Warm air unit heaters, oil fired	All capacities	Maximum capacity[b]	80% E_c	UL 731

For SI: 1 British thermal unit per hour = 0.2931 W.

a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

b. Minimum and maximum ratings as provided for and allowed by the unit's controls.

c. Combination units not covered by the National Appliance Energy Conservation Act of 1987 (NAECA) (3-phase power or cooling capacity greater than or equal to 65,000 Btu/h [19 kW]) shall comply with either rating.

d. E_t = Thermal efficiency. See test procedure for detailed discussion.

e. E_c = Combustion efficiency (100% less flue losses). See test procedure for detailed discussion.

f. E_c = Combustion efficiency. Units must also include an IID, have jackets not exceeding 0.75 percent of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

g. E_t = Thermal efficiency. Units must also include an IID, have jacket losses not exceeding 0.75 percent of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

TABLE 503.2.3(5)
BOILERS, GAS- AND OIL-FIRED, MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE[f]	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY[c, d, e]	TEST PROCEDURE[a]
Boilers, Gas fired	< 300,000 Btu/h	Hot water	80% AFUE	DOE 10 CFR Part 430
		Steam	75% AFUE	
	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h	Minimum capacity[b]	75% E_t	H.I. HBS
	>2,500,000 Btu/h[f]	Hot water	80% E_c	
		Steam	80% E_c	
Boilers, Oil fired	< 300,000 Btu/h	—	80% AFUE	DOE 10 CFR Part 430
	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h	Minimum capacity[b]	78% E_t	H.I. HBS
	> 2,500,000 Btu/h[f]	Hot water	83% E_c	
		Steam	83% E_c	
Boilers, Oil fired (Residual)	≥ 300,000 Btu/h and ≤ 2,500,000 Btu/h	Minimum capacity[b]	78% E_t	H.I. HBS
	> 2,500,000 Btu/h[f]	Hot water	83% E_c	
		Steam	83% E_c	

For SI: 1 British thermal unit per hour = 0.2931 W.

a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

b. Minimum ratings as provided for and allowed by the unit's controls.

c. E_c = Combustion efficiency (100 percent less flue losses). See reference document for detailed information.

d. E_t = Thermal efficiency. See reference document for detailed information.

e. Alternative test procedures used at the manufacturer's option are ASME PTC-4.1 for units greater than 5,000,000 Btu/h input, or ANSI Z21.13 for units greater than or equal to 300,000 Btu/h and less than or equal to 2,500,000 Btu/h input.

f. These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers, and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.

TABLE 503.2.3(6)
CONDENSING UNITS, ELECTRICALLY OPERATED, MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	MINIMUM EFFICIENCY[b]	TEST PROCEDURE[a]
Condensing units, air cooled	≥ 135,000 Btu/h	10.1 EER 11.2 IPLV	ARI 365
Condensing units, water or evaporatively cooled	≥ 135,000 Btu/h	13.1 EER 13.1 IPLV	

For SI: 1 British thermal unit per hour = 0.2931 W.

a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

b. IPLVs are only applicable to equipment with capacity modulation.

TABLE 503.2.3(7)
WATER CHILLING PACKAGES, MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	MINIMUM EFFICIENCY[b]	TEST PROCEDURE[a]
Air cooled, with condenser, electrically operated	< 150 tons	2.80 COP 2.80 IPLV	ARI 550/590
	≥ 150 tons	2.50 COP 2.50 IPLV	
Air cooled, without condenser, electrically operated	All capacities	3.10 COP 3.10 IPLV	ARI 550/590
Water cooled, electrically operated, positive displacement (reciprocating)	All capacities	4.20 COP 4.65 IPLV	
Water cooled, electrically operated, positive displacement (rotary screw and scroll)	< 150 tons	4.45 COP 4.50 IPLV	ARI 550/590
	≥ 150 tons and < 300 tons	4.90 COP 4.95 IPLV	
	≥ 300 tons	5.50 COP 5.60 IPLV	
Water cooled, electrically operated, centrifugal	< 150 tons	5.00 COP 5.00 IPLV	ARI 550/590
	≥ 150 tons and < 300 tons	5.55 COP 5.55 IPLV	
	≥ 300 tons	6.10 COP 6.10 IPLV	
Air cooled, absorption single effect	All capacities	0.60 COP	ARI 560
Water cooled, absorption single effect	All capacities	0.70 COP	
Absorption double effect, indirect-fired	All capacities	1.00 COP 1.05 IPLV	
Absorption double effect, direct-fired	All capacities	1.00 COP 1.00 IPLV	

For SI: 1 ton = 3.517 kW. °C = [(°F) - 32]/1.8.

a. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

b. The chiller equipment requirements do not apply for chillers used in low temperature applications where the design leaving fluid temperature is less than or equal to 40°F.

TABLE 503.2.3(8)
COPs AND IPLVs FOR NONSTANDARD CENTRIFUGAL CHILLERS < 150 TONS

CENTRIFUGAL CHILLERS < 150 TONS COP_{std} = 5.4								
Leaving chilled water temperature (°F)	Entering condenser water temperature (°F)	Lift[a] (°F)	Condenser flow rate					
			2 gpm/ton	2.5 gpm/ton	3 gpm/ton	4 gpm/ton	5 gpm/ton	6 gpm/ton
			Required COP and IPLV					
46	75	29	6.00	6.27	6.48	6.80	7.03	7.20
45	75	30	5.92	6.17	6.37	6.66	6.87	7.02
44	75	31	5.84	6.08	6.26	6.53	6.71	6.86
43	75	32	5.75	5.99	6.16	6.40	6.58	6.71
42	75	33	5.67	5.90	6.06	6.29	6.45	6.57
41	75	34	5.59	5.82	5.98	6.19	6.34	6.44
46	80	34	5.59	5.82	5.98	6.19	6.34	6.44
40	75	35	5.50	5.74	5.89	6.10	6.23	6.33
45	80	35	5.50	5.74	5.89	6.10	6.23	6.33
44	80	36	5.41	5.66	5.81	6.01	6.13	6.22
43	80	37	5.31	5.57	5.73	5.92	6.04	6.13
42	80	38	5.21	5.48	5.64	5.84	5.95	6.04
41	80	39	5.09	5.39	5.56	5.76	5.87	5.95
46	85	39	5.09	5.39	5.56	5.76	5.87	5.95
40	80	40	4.96	5.29	5.47	5.67	5.79	5.86
45	85	40	4.96	5.29	5.47	5.67	5.79	5.86
44	85	41	4.83	5.18	5.40	5.59	5.71	5.78
43	85	42	4.68	5.07	5.28	5.50	5.62	5.70
42	85	43	4.51	4.94	5.17	5.41	5.54	5.62
41	85	44	4.33	4.80	5.05	5.31	5.45	5.53
40	85	45	4.13	4.65	4.92	5.21	5.35	5.44
Condenser ΔT[b]			14.04	11.23	9.36	7.02	5.62	4.68

For SI: °C = [(°F) - 32] / 1.8, 1 gallon per minute = 3.785 L/min., 1 ton = 12,000 British thermal units per hour = 3.517 kW.

a. Lift = Entering condenser water temperature (°F) - Leaving chilled water temperature (°F).

b. Condenser ΔT = Leaving condenser water temperature (°F) - Entering condenser water temperature (°F).

$K_{adj} = 6.1507 - 0.30244(X) + 0.0062692(X)^2 - 0.000045595(X)$

where: X = Condenser ΔT + Lift

$COP_{adj} = K_{adj} \times COP_{std}$

TABLE 503.2.3(9)
COPs AND IPLVs FOR NONSTANDARD CENTRIFUGAL CHILLERS ≥ 150 TONS, ≤ 300 TONS

CENTRIFUGAL CHILLERS ≥ 150 Tons, ≤ 300 Tons COP_{std} = 5.55								
Leaving chilled water temperature (°F)	Entering condenser water temperature (°F)	Lift[a] (°F)	Condenser flow rate					
			2 gpm/ton	2.5 gpm/ton	3 gpm/ton	4 gpm/ton	5 gpm/ton	6 gpm/ton
			Required COP and IPLV					
46	75	29	6.17	6.44	6.66	6.99	7.23	7.40
45	75	30	6.08	6.34	6.54	6.84	7.06	7.22
44	75	31	6.00	6.24	6.43	6.71	6.90	7.05
43	75	32	5.91	6.15	6.33	6.58	6.76	6.89
42	75	33	5.83	6.07	6.23	6.47	6.63	6.75
41	75	34	5.74	5.98	6.14	6.36	6.51	6.62
46	80	34	5.74	5.98	6.14	6.36	6.51	6.62
40	75	35	5.65	5.90	6.05	6.26	6.40	6.51
45	80	35	5.65	5.90	6.05	6.26	6.40	6.51
44	80	36	5.56	5.81	5.97	6.17	6.30	6.40
43	80	37	5.46	5.73	5.89	6.08	6.21	6.30
42	80	38	5.35	5.64	5.8	6.00	6.12	6.20
41	80	39	5.23	5.54	5.71	5.91	6.03	6.11
46	85	39	5.23	5.54	5.71	5.91	6.03	6.11
40	80	40	5.10	5.44	5.62	5.83	5.95	6.03
45	85	40	5.10	5.44	5.62	5.83	5.95	6.03
44	85	41	4.96	5.33	5.55	5.74	5.86	5.94
43	85	42	4.81	5.21	5.42	5.66	5.78	5.86
42	85	43	4.63	5.08	5.31	5.56	5.69	5.77
41	85	44	4.45	4.93	5.19	5.46	5.60	5.69
40	85	45	4.24	4.77	5.06	5.35	5.50	5.59
Condenser ΔT[b]			14.04	11.23	9.36	7.02	5.62	4.68

For SI: °C = [(°F) - 32] / 1.8, 1 gallon per minute = 3.785 L/min., 1 ton = 12,000 British thermal units per hour = 3.517 kW.

a. Lift = Entering condenser water temperature (°F) - Leaving chilled water temperature (°F).

b. Condenser ΔT = Leaving condenser water temperature (°F) - Entering condenser water temperature (°F).

$K_{adj} = 6.1507 - 0.30244(X) + 0.0062692(X)^2 - 0.000045595(X)$

where: X = Condenser ΔT + Lift $COP_{adj} = K_{adj} \times COP_{std}$

TABLE 503.2.3(10)
COPs AND IPLVs FOR NONSTANDARD CENTRIFUGAL CHILLERS > 300 TONS

CENTRIFUGAL CHILLERS > 300 Tons COP_{std} = 6.1								
Leaving chilled water temperature (°F)	Entering condenser water temperature (°F)	Lift[a] (°F)	Condenser flow rate					
			2 gpm/ton	2.5 gpm/ton	3 gpm/ton	4 gpm/ton	5 gpm/ton	6 gpm/ton
			Required COP and IPLV					
46	75	29	6.80	7.11	7.35	7.71	7.97	8.16
45	75	30	6.71	6.99	7.21	7.55	7.78	7.96
44	75	31	6.61	6.89	7.09	7.40	7.61	7.77
43	75	32	6.52	6.79	6.98	7.26	7.45	7.60
42	75	33	6.43	6.69	6.87	7.13	7.31	7.44
41	75	34	6.33	6.60	6.77	7.02	7.18	7.30
46	80	34	6.33	6.60	6.77	7.02	7.18	7.30
40	75	35	6.23	6.50	6.68	6.91	7.06	7.17
45	80	35	6.23	6.50	6.68	6.91	7.06	7.17
44	80	36	6.13	6.41	6.58	6.81	6.95	7.05
43	80	37	6.02	6.31	6.49	6.71	6.85	6.94
42	80	38	5.90	6.21	6.40	6.61	6.75	6.84
41	80	39	5.77	6.11	6.30	6.52	6.65	6.74
46	85	39	5.77	6.11	6.30	6.52	6.65	6.74
40	80	40	5.63	6.00	6.20	6.43	6.56	6.65
45	85	40	5.63	6.00	6.20	6.43	6.56	6.65
44	85	41	5.47	5.87	6.10	6.33	6.47	6.55
43	85	42	5.30	5.74	5.98	6.24	6.37	6.46
42	85	43	5.11	5.60	5.86	6.13	6.28	6.37
41	85	44	4.90	5.44	5.72	6.02	6.17	6.27
40	85	45	4.68	5.26	5.58	5.90	6.07	6.17
Condenser ΔT[b]			14.04	11.23	9.36	7.02	5.62	4.68

For SI: °C = [(°F) - 32] / 1.8, 1 gallon per minute = 3.785 L/min., 1 ton = 12,000 British thermal units per hour = 3.517 kW.

a. Lift = Entering condenser water temperature (°F) - Leaving chilled water temperature (°F).

b. Condenser ΔT = Leaving condenser water temperature (°F) - Entering condenser water temperature (°F).

$K_{adj} = 6.1507 - 0.030244(X) + 0.0062692(X)^2 - 0.000045595(X)$

where: X = Condenser ΔT + Lift

$COP_{adj} = K_{adj} \times COP_{std}$

TABLE 503.2.3(11)
PERFORMANCE REQUIREMENTS FOR HEAT REJECTION EQUIPMENT

EQUIPMENT TYPE	TOTAL SYSTEM HEAT REJECTION CAPACITY AT RATED CONDITIONS	SUBCATEGORY OR RATING CONDITION	PERFORMANCE REQUIRED[a, b]	TEST PROCEDURE[c]
Propeller or axial fan cooling towers	All	95°F entering water 85°F leaving water 75°F wb outdoor air	≥ 38.2 gpm/hp	CTI ATC-105 and CTI STD-201
Centrifugal fan cooling towers	All	95°F entering water 85°F leaving water 75°F wb outdoor air	≥ 20.0 gpm/hp	CTI ATC-105 and CTI STD-201
Air cooled condensers	All	125°F condensing temperature R-22 test fluid 190°F entering gas temperature 15°F subcooling 95°F entering db	≥ 176,000 Btu/h · hp (69 COP)	ARI 460

For SI: °C = [(°F) - 32] / 1.8, 1 British thermal unit per hour = 0.2931 W, 1 gallon per minute per horsepower = 0.846 L/s · kW.
wb = wet-bulb temperature, °F

a. For purposes of this table, cooling tower performance is defined as the maximum flow rating of the tower units (gpm) divided by the fan nameplate rated motor power units (hp).

b. For purposes of this table, air-cooled condenser performance is defined as the heat rejected from the refrigerant units (Btu/h) divided by the fan nameplate rated motor power units (hp).

c. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

503.2.4.3.1 Thermostatic setback capabilities. Thermostatic setback controls shall have the capability to set back or temporarily operate the system to maintain zone temperatures down to 55°F (13°C) or up to 85°F (29°C).

503.2.4.3.2 Automatic setback and shutdown capabilities. Automatic time clock or programmable controls shall be capable of starting and stopping the system for seven different daily schedules per week and retaining their programming and time setting during a loss of power for at least 10 hours. Additionally, the controls shall have a manual override that allows temporary operation of the system for up to 2 hours; a manually operated timer capable of being adjusted to operate the system for up to 2 hours; or an occupancy sensor.

503.2.4.4 Shutoff damper controls. Both outdoor air supply and exhaust ducts shall be equipped with motorized dampers that will automatically shut when the systems or spaces served are not in use.

Exceptions:

1. Gravity dampers shall be permitted in buildings less than three stories in height.
2. Gravity dampers shall be permitted for buildings of any height located in climate zones 1, 2, and 3.
3. Gravity dampers shall be permitted for outside air intake or exhaust airflows of 300 cfm (.14 m^3/s) or less.

503.2.5 Ventilation. Ventilation, either natural or mechanical, shall be provided in accordance with Chapter 4 of the *International Mechanical Code*. Where mechanical ventilation is provided, the system shall provide the capability to reduce the outdoor air supply to the minimum required by Chapter 4 of the *International Mechanical Code*.

503.2.6 Energy recovery ventilation systems. Individual fan systems that have both a design supply air capacity of 5,000 cfm (2.36 m^3/s) or greater and a minimum outside air supply of 70 percent or greater of the design supply air quantity shall have an energy recovery system that provides a change in the enthalpy of the outdoor air supply of 50 percent or more of the difference between the outdoor air and return air at design conditions. Provision shall be made to bypass or control the energy recovery system to permit cooling with outdoor air where cooling with outdoor air is required.

Exception: An energy recovery ventilation system shall not be required in any of the following conditions:

1. Where energy recovery systems are prohibited by the *International Mechanical Code*.
2. Laboratory fume hood systems with a total exhaust rate of 15,000 cfm (7.08 m^3/s) or less.
3. Laboratory fume hood systems with a total exhaust rate greater than 15,000 cfm (7.08 m^3/s) that include at least one of the following features:
   3.1. Variable-air-volume hood exhaust and room supply systems capable of reducing exhaust and makeup air volume to 50 percent or less of design values.
   3.2. Direct makeup (auxiliary) air supply equal to at least 75 percent of the exhaust rate, heated no warmer than 2°F (1.1°C) below room set point, cooled to no cooler than 3°F (1.7°C) above room set point, no humidification

added, and no simultaneous heating and cooling used for dehumidification control.

4. Systems serving spaces that are not cooled and are heated to less than 60°F (15.5°C).
5. Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site solar energy.
6. Heating systems in climates with less than 3600 HDD.
7. Cooling systems in climates with a 1 percent cooling design wet-bulb temperature less than 64°F (17.7°C).
8. Systems requiring dehumidification that employ series-style energy recovery coils wrapped around the cooling coil.

503.2.7 Duct and plenum insulation and sealing. All supply and return air ducts and plenums shall be insulated with a minimum of R-5 insulation when located in unconditioned spaces and with a minimum of R-8 insulation when located outside the building. When located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by a minimum of R-8 insulation.

Exceptions:

1. When located within equipment.
2. When the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15°F (8°C).

All joints, longitudinal and transverse seams and connections in ductwork, shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes. Tapes and mastics used to seal ductwork shall be listed and labeled in accordance with UL 181A and shall be marked "181A-P" for pressure-sensitive tape, "181A-M" for mastic or "181A-H" for heat-sensitive tape. Tapes and mastics used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked "181B-FX" for pressure-sensitive tape or "181B-M" for mastic. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked 181B-C. Unlisted duct tape is not permitted as a sealant on any duct.

503.2.7.1 Duct construction. Ductwork shall be constructed and erected in accordance with the *International Mechanical Code*.

503.2.7.1.1 Low-pressure duct systems. All longitudinal and transverse joints, seams and connections of supply and return ducts operating at a static pressure less than or equal to 2 inches w.g. (500 Pa) shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes installed in accordance with the manufacturer's installation instructions. Pressure classifications specific to the duct system shall be clearly indicated on the construction documents in accordance with the *International Mechanical Code*.

Exception: Continuously welded and locking-type longitudinal joints and seams on ducts operating at static pressures less than 2 inches w.g. (500 Pa) pressure classification.

503.2.7.1.2 Medium-pressure duct systems. All ducts and plenums designed to operate at a static pressure greater than 2 inches w.g. (500 Pa) but less than 3 inches w.g. (750 Pa) shall be insulated and sealed in accordance with Section 503.2.7. Pressure classifications specific to the duct system shall be clearly indicated on the construction documents in accordance with the *International Mechanical Code*.

503.2.7.1.3 High-pressure duct systems. Ducts designed to operate at static pressures in excess of 3 inches w.g. (746 Pa) shall be insulated and sealed in accordance with Section 503.2.7. In addition, ducts and plenums shall be leak-tested in accordance with the SMACNA *HVAC Air Duct Leakage Test Manual* with the rate of air leakage (*CL*) less than or equal to 6.0 as determined in accordance with Equation 5-2.

$$CL = F \times P^{0.65} \qquad \textbf{(Equation 5-2)}$$

where:

F = The measured leakage rate in cfm per 100 square feet of duct surface.

P = The static pressure of the test.

Documentation shall be furnished by the designer demonstrating that representative sections totaling at least 25 percent of the duct area have been tested and that all tested sections meet the requirements of this section.

503.2.8 Piping insulation. All piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table 503.2.8.

Exceptions:

1. Factory-installed piping within HVAC equipment tested and rated in accordance with a test procedure referenced by this code.
2. Piping that conveys fluids that have a design operating temperature range between 55°F (13°C) and 105°F (41°C).
3. Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.
4. Runout piping not exceeding 4 feet (1219 mm) in length and 1 inch (25 mm) in diameter between the control valve and HVAC coil.

TABLE 503.2.8
MINIMUM PIPE INSULATION[a]
(thickness in inches)

FLUID	NOMINAL PIPE DIAMETER	
	≤1.5"	> 1.5"
Steam	1 1/2	3
Hot water	1	2
Chilled water, brine or refrigerant	1	1 1/2

For SI: 1 inch = 25.4 mm, British thermal unit per inch/h · ft^2 · °F = W per 25 mm/K · m^2

a. Based on insulation having a conductivity (k) not exceeding 0.27 Btu per inch/h · ft^2 · °F.

503.2.9 HVAC system completion. Prior to the issuance of a certificate of occupancy, the design professional shall provide evidence of system completion in accordance with Sections 503.2.9.1 through 503.2.9.3.

503.2.9.1 Air system balancing. Each supply air outlet and zone terminal device shall be equipped with means for air balancing in accordance with the requirements of Chapter 6 of the *International Mechanical Code*. Discharge dampers are prohibited on constant volume fans and variable volume fans with motors 25 hp (18.6 kW) and larger.

503.2.9.2 Hydronic system balancing. Individual hydronic heating and cooling coils shall be equipped with means for balancing and pressure test connections.

503.2.9.3 Manuals. The construction documents shall require that an operating and maintenance manual be provided to the building owner by the mechanical contractor. The manual shall include, at least, the following:

1. Equipment capacity (input and output) and required maintenance actions.
2. Equipment operation and maintenance manuals.
3. HVAC system control maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings, at control devices or, for digital control systems, in programming comments.
4. A complete written narrative of how each system is intended to operate.

503.3 Simple HVAC systems and equipment. (Prescriptive). This section applies to buildings served by unitary or packaged HVAC equipment listed in Tables 503.2.3(1) through 503.2.3(5), each serving one zone and controlled by a single thermostat in the zone served. It also applies to two-pipe heating systems serving one or more zones, where no cooling system is installed.

This section does not apply to fan systems serving multiple zones, nonunitary or nonpackaged HVAC equipment and systems or hydronic or steam heating and hydronic cooling equipment and distribution systems that provide cooling or cooling and heating which are covered by Section 503.4.

503.3.1 Economizers. Supply air economizers shall be provided on each cooling system as shown in Table 503.3.1(1).

Economizers shall be capable of providing 100-percent outdoor air, even if additional mechanical cooling is required to meet the cooling load of the building. Systems shall provide a means to relieve excess outdoor air during economizer operation to prevent overpressurizing the building. The relief air outlet shall be located to avoid recirculation into the building. Where a single room or space is supplied by multiple air systems, the aggregate capacity of those systems shall be used in applying this requirement.

Exceptions:

1. Where the cooling equipment is covered by the minimum efficiency requirements of Table 503.2.3(1) or 503.2.3(2) and meets or exceeds the minimum cooling efficiency requirement (EER) by the percentages shown in Table 503.3.1(2).
2. Systems with air or evaporatively cooled condensors and which serve spaces with open case refrigeration or that require filtration equipment in order to meet the minimum ventilation requirements of Chapter 4 of the *International Mechanical Code*.

TABLE 503.3.1(1)
ECONOMIZER REQUIREMENTS

CLIMATE ZONES	ECONOMIZER REQUIREMENT
1A, 1B, 2A, 3A, 4A, 7, 8	No requirement
2B, 3B, 3C, 4B, 4C, 5B, 5C, 6B	Economizers on all cooling systems ≥ 54,000 Btu/h
5A, 6A	Economizers on all cooling systems ≥ 135,000 Btu/h

For SI: 1 British thermal unit per hour = 0.293 W.

TABLE 503.3.1(2)
EQUIPMENT EFFICIENCY PERFORMANCE EXCEPTION FOR ECONOMIZERS

CLIMATE ZONES	COOLING EQUIPMENT PERFORMANCE IMPROVEMENT (EER OR IPLV)
2B	10% Efficiency Improvement
3B	15% Efficiency Improvement
4B	20% Efficiency Improvement

503.3.2 Hydronic system controls. Hydronic systems of at least 300,000 Btu/h (87,930 W) design output capacity supplying heated and chilled water to comfort conditioning systems shall include controls that meet the requirements of Section 503.4.3.

503.4 Complex HVAC systems and equipment. (Prescriptive). This section applies to buildings served by HVAC equipment and systems not covered in Section 503.3.

503.4.1 Economizers. Supply air economizers shall be provided on each cooling system according to Table 503.3.1(1). Economizers shall be capable of operating at 100 percent outside air, even if additional mechanical cooling is required to meet the cooling load of the building.

Exceptions:

1. Systems utilizing water economizers that are capable of cooling supply air by direct or indirect evaporation or both and providing 100 percent of the expected system cooling load at outside air temperatures of 50°F (10°C) dry bulb/45°F (7°C) wet bulb and below.
2. Where the cooling equipment is covered by the minimum efficiency requirements of Table 503.2.3(1), 503.2.3(2), or 503.2.3(6) and meets or exceeds the minimum EER by the percentages shown in Table 503.3.1(2)
3. Where the cooling equipment is covered by the minimum efficiency requirements of Table 503.2.3(7) and meets or exceeds the minimum integrated part load value (IPLV) by the percentages shown in Table 503.3.1(2).

503.4.2 Variable air volume (VAV) fan control. Individual VAV fans with motors of 10 horsepower (7.5 kW) or greater shall be:

1. Driven by a mechanical or electrical variable speed drive; or
2. The fan motor shall have controls or devices that will result in fan motor demand of no more than 30 percent of their design wattage at 50 percent of design air flow when static pressure set point equals one-third of the total design static pressure, based on manufacturer's certified fan data.

For systems with direct digital control of individual zone boxes reporting to the central control panel, the static pressure set point shall be reset based on the zone requiring the most pressure, i.e., the set point is reset lower until one zone damper is nearly wide open.

503.4.3 Hydronic systems controls. The heating of fluids that have been previously mechanically cooled and the cooling of fluids that have been previously mechanically heated shall be limited in accordance with Sections 503.4.3.1 through 503.4.3.3. Hydronic heating systems comprised of multiple-packaged boilers and designed to deliver conditioned water or steam into a common distribution system shall include automatic controls capable of sequencing operation of the boilers. Hydronic heating systems comprised of a single boiler and greater than 500,000 Btu/h input design capacity shall include either a multistaged or modulating burner.

503.4.3.1 Three-pipe system. Hydronic systems that use a common return system for both hot water and chilled water are prohibited.

503.4.3.2 Two-pipe changeover system. Systems that use a common distribution system to supply both heated and chilled water shall be designed to allow a dead band between changeover from one mode to the other of at least 15°F (8.3°C) outside air temperatures; be designed to and provided with controls that will allow operation in one mode for at least 4 hours before changing over to the other mode; and be provided with controls that allow heating and cooling supply temperatures at the changeover point to be no more than 30°F (16.7°C) apart.

503.4.3.3 Hydronic (water loop) heat pump systems. Hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection and heat addition shall have controls that are capable of providing a heat pump water supply temperature dead band of at least 20°F (11.1°C) between initiation of heat rejection and heat addition by the central devices. For Climate Zones 3 through 8 as indicated in Figure 301.1 and Table 301.1, if a closed-circuit cooling tower is used, either an automatic valve shall be installed to bypass all but a minimal flow of water around the tower, or lower leakage positive closure dampers shall be provided. If an open-circuit tower is used directly in the heat pump loop, an automatic valve shall be installed to bypass all heat pump water flow around the tower. If an open-circuit cooling tower is used in conjunction with a separate heat exchanger to isolate the cooling tower from the heat pump loop, then heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop. Each hydronic heat pump on the hydronic system having a total pump system power exceeding 10 horsepower (hp) (7.5 kW) shall have a two-position valve.

Exception: Where a system loop temperature optimization controller is installed and can determine the most efficient operating temperature based on real time conditions of demand and capacity, dead bands of less than 20°F (11.1°C) shall be permitted.

503.4.3.4 Part load controls. Hydronic systems greater than or equal to 300,000 Btu/h (87,930 W) in design output capacity supplying heated or chilled water to comfort conditioning systems shall include controls that have the capability to:

1. Automatically reset the supply-water temperatures using zone-return water temperature, building-return water temperature, or outside air temperature as an indicator of building heating or cooling demand. The temperature shall be capable of being reset by at least 25 percent of the design supply-to-return water temperature difference; or
2. Reduce system pump flow by at least 50 percent of design flow rate utilizing adjustable speed drive(s) on pump(s), or multiple-staged pumps where at least one-half of the total pump horsepower is capable of being automatically turned off or control valves designed to modulate or step down, and close, as a function of load, or other approved means.

503.4.3.5 Pump isolation. Chilled water plants including more than one chiller shall have the capability to reduce flow automatically through the chiller plant when a chiller is shut down. Chillers piped in series for the purpose of increased temperature differential, shall be considered as one chiller.

Boiler plants including more than one boiler shall have the capability to reduce flow automatically through the boiler plant when a boiler is shut down.

503.4.4 Heat rejection equipment fan speed control. Each fan powered by a motor of 7.5 hp (5.6 kW) or larger shall have the capability to operate that fan at two-thirds of full speed or less, and shall have controls that automatically change the fan speed to control the leaving fluid temperature or condensing temperature/pressure of the heat rejection device.

Exception: Factory-installed heat rejection devices within HVAC equipment tested and rated in accordance with Tables 503.2.3(6) through 503.2.3(11).

503.4.5 Requirements for complex mechanical systems serving multiple zones. Sections 503.4.5.1 through 503.4.5.3 shall apply to complex mechanical systems serving multiple zones. Supply air systems serving multiple zones shall be VAV systems which, during periods of occupancy, are designed and capable of being controlled to reduce primary air supply to each zone to one of the following before reheating, recooling or mixing takes place:

1. Thirty percent of the maximum supply air to each zone.
2. Three hundred cfm (142 L/s) or less where the maximum flow rate is less than 10 percent of the total fan system supply airflow rate.
3. The minimum ventilation requirements of Chapter 4 of the *International Mechanical Code*.

Exception: The following define when individual zones or when entire air distribution systems are exempted from the requirement for VAV control:

1. Zones where special pressurization relationships or cross-contamination requirements are such that VAV systems are impractical.
2. Zones or supply air systems where at least 75 percent of the energy for reheating or for providing warm air in mixing systems is provided from a site-recovered or site-solar energy source.
3. Zones where special humidity levels are required to satisfy process needs.
4. Zones with a peak supply air quantity of 300 cfm (142 L/s) or less and where the flow rate is less than 10 percent of the total fan system supply airflow rate.
5. Zones where the volume of air to be reheated, recooled or mixed is no greater than the volume of outside air required to meet the minimum ventilation requirements of Chapter 4 of the *International Mechanical Code*.
6. Zones or supply air systems with thermostatic and humidistatic controls capable of operating in sequence the supply of heating and cooling energy to the zone(s) and which are capable of preventing reheating, recooling, mixing or simultaneous supply of air that has been previously cooled, either mechanically or through the use of economizer systems, and air that has been previously mechanically heated.

503.4.5.1 Single duct variable air volume (VAV) systems, terminal devices. Single duct VAV systems shall use terminal devices capable of reducing the supply of primary supply air before reheating or recooling takes place.

503.4.5.2 Dual duct and mixing VAV systems, terminal devices. Systems that have one warm air duct and one cool air duct shall use terminal devices which are capable of reducing the flow from one duct to a minimum before mixing of air from the other duct takes place.

503.4.5.3 Single fan dual duct and mixing VAV systems, economizers. Individual dual duct or mixing heating and cooling systems with a single fan and with total capacities greater than 90,000 Btu/h [(26 375 W) 7.5 tons] shall not be equipped with air economizers.

503.4.6 Heat recovery for service water heating. Condenser heat recovery shall be installed for heating or reheating of service hot water provided the facility operates 24 hours a day, the total installed heat capacity of water-cooled systems exceeds 6,000,000 Btu/hr of heat rejection, and the design service water heating load exceeds 1,000,000 Btu/h.

The required heat recovery system shall have the capacity to provide the smaller of:

1. Sixty percent of the peak heat rejection load at design conditions; or
2. The preheating required to raise the peak service hot water draw to 85°F (29°C).

Exceptions:

1. Facilities that employ condenser heat recovery for space heating or reheat purposes with a heat recovery design exceeding 30 percent of the peak water-cooled condenser load at design conditions.
2. Facilities that provide 60 percent of their service water heating from site solar or site recovered energy or from other sources.

SECTION 504
SERVICE WATER HEATING
(Mandatory)

504.1 General. This section covers the minimum efficiency of, and controls for, service water-heating equipment and insulation of service hot water piping.

504.2 Service water-heating equipment performance efficiency. Water-heating equipment and hot water storage tanks shall meet the requirements of Table 504.2. The efficiency shall be verified through data furnished by the manufacturer or through certification under an approved certification program.

504.3 Temperature controls. Service water-heating equipment shall be provided with controls to allow a setpoint of 110°F (43°C) for equipment serving dwelling units and 90°F (32°C) for equipment serving other occupancies. The outlet temperature of lavatories in public facility rest rooms shall be limited to 110°F (43°C).

504.4 Heat traps. Water-heating equipment not supplied with integral heat traps and serving noncirculating systems shall be provided with heat traps on the supply and discharge piping associated with the equipment.

504.5 Pipe insulation. For automatic-circulating hot water systems, piping shall be insulated with 1 inch (25 mm) of insulation having a conductivity not exceeding 0.27 Btu per inch/h × ft^2 × °F (1.53 W per 25 mm/m^2 × K). The first 8 feet (2438 mm) of piping in noncirculating systems served by equipment without integral heat traps shall be insulated with 0.5 inch (12.7 mm) of material having a conductivity not exceeding 0.27 Btu per inch/h × ft^2 × °F (1.53 W per 25 mm/m^2 × K).

504.6 Hot water system controls. Automatic-circulating hot water system pumps or heat trace shall be arranged to be conveniently turned off automatically or manually when the hot water system is not in operation.

504.7 Pools. Pools shall be provided with energy conserving measures in accordance with Sections 504.7.1 through 504.7.3.

504.7.1 Pool heaters. All pool heaters shall be equipped with a readily accessible on-off switch to allow shutting off the heater without adjusting the thermostat setting. Pool heaters fired by natural gas shall not have continuously burning pilot lights.

504.7.2 Time switches. Time switches that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed on swimming pool heaters and pumps.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Where pumps are required to operate solar-and waste-heat-recovery pool heating systems.

504.7.3 Pool covers. Heated pools shall be equipped with a vapor retardant pool cover on or at the water surface. Pools heated to more than 90°F (32°C) shall have a pool cover with a minimum insulation value of R-12.

Exception: Pools deriving over 60 percent of the energy for heating from site-recovered energy or solar energy source.

SECTION 505
ELECTRICAL POWER AND LIGHTING SYSTEMS
(Mandatory)

505.1 General. (Mandatory). This section covers lighting system controls, the connection of ballasts, the maximum lighting power for interior applications, and minimum acceptable lighting equipment for exterior applications.

Exception: Lighting within dwelling units.

505.2 Lighting controls. (Mandatory). Lighting systems shall be provided with controls as required in Sections 505.2.1, 505.2.2 , 505.2.3 and 505.2.4.

505.2.1 Interior lighting controls. Each area enclosed by walls or floor-to-ceiling partitions shall have at least one manual control for the lighting serving that area. The required controls shall be located within the area served by the controls or be a remote switch that identifies the lights served and indicates their status.

Exceptions:

1. Areas designated as security or emergency areas that must be continuously lighted.
2. Lighting in stairways or corridors that are elements of the means of egress.

505.2.2 Additional controls. Each area that is required to have a manual control shall have additional controls that meet the requirements of Sections 505.2.2.1 and 505.2.2.2.

505.2.2.1 Light reduction controls. Each area that is required to have a manual control shall also allow the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern by at least 50 percent. Lighting reduction shall be achieved by one of the following or other approved method:

1. Controlling all lamps or luminaires;
2. Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps;
3. Switching the middle lamp luminaires independently of the outer lamps; or
4. Switching each luminaire or each lamp.

Exceptions:

1. Areas that have only one luminaire.
2. Areas that are controlled by an occupant-sensing device.
3. Corridors, storerooms, restrooms or public lobbies.
4. Sleeping unit (see Section 505.2.3).
5. Spaces that use less than 0.6 watts per square foot (6.5 W/m^2).

TABLE 504.2
MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT

EQUIPMENT TYPE	SIZE CATEGORY (input)	SUBCATEGORY OR RATING CONDITION	PERFORMANCE REQUIRED[a, b]	TEST PROCEDURE
Water heaters, Electric	≤ 12 kW	Resistance	0.97 - 0.00132V, EF	DOE 10 CFR Part 430
	> 12 kW	Resistance	1.73V + 155 SL, Btu/h	ANSI Z21.10.3
	≤ 24 amps and ≤ 250 volts	Heat pump	0.93 - 0.00132V, EF	DOE 10 CFR Part 430
Storage water heaters, Gas	≤ 75,000 Btu/h	≥ 20 gal	0.67 - 0.0019V, EF	DOE 10 CFR Part 430
	> 75,000 Btu/h and ≤ 155,000 Btu/h	< 4,000 Btu/h/gal	$80\% E_t$ $\left(Q / 800 + 110\sqrt{V}\right)$SL, Btu/h	ANSI Z21.10.3
	> 155,000 Btu/h	< 4,000 Btu/h/gal	$80\% E_t$ $\left(Q / 800 + 110\sqrt{V}\right)$ SL, Btu/h	
Instantaneous water heaters, Gas	> 50,000 Btu/h and < 200,000 Btu/h[c]	≥ 4,000 (Btu/h)/gal and < 2 gal	0.62 - 0.0019V, EF	DOE 10 CFR Part 430
	≥ 200,000 Btu/h	≥ 4,000 Btu/h/gal and < 10 gal	$80\% E_t$	ANSI Z21.10.3
	≥ 200,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	$80\% E_t$ $\left(Q / 800 + 110\sqrt{V}\right)$ SL, Btu/h	
Storage water heaters, Oil	≤ 105,000 Btu/h	≥20 gal	0.59 - 0.0019V, EF	DOE 10 CFR Part 430
	> 105,000 Btu/h	< 4,000 Btu/h/gal	$78\% E_t$ $\left(Q / 800 + 110\sqrt{V}\right)$ SL, Btu/h	ANSI Z21.10.3
Instantaneous water heaters, Oil	≤ 210,000 Btu/h	≥ 4,000 Btu/h/gal and < 2 gal	0.59 - 0.0019V, EF	DOE 10 CFR Part 430
	> 210,000 Btu/h	≥ 4,000 Btu/h/gal and < 10 gal	$80\% E_t$	ANSI Z21.10.3
	> 210,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	$78\% E_t$ $\left(Q / 800 + 110\sqrt{V}\right)$ SL, Btu/h	
Hot water supply boilers, Gas and Oil	≥ 300,000 Btu/h and <12,500,000 Btu/h	≥ 4,000 Btu/h/gal and < 10 gal	$80\% E_t$	ANSI Z21.10.3
Hot water supply boilers, Gas	≥ 300,000 Btu/h and <12,500,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	$80\% E_t$ $\left(Q / 800 + 110\sqrt{V}\right)$ SL, Btu/h	
Hot water supply boilers, Oil	>300,000 Btu/h and <12,500,000 Btu/h	> 4,000 Btu/h/gal and > 10 gal	$78\% E_t$ $\left(Q / 800 + 110\sqrt{V}\right)$ SL, Btu/h	
Pool heaters, Gas and Oil	All	—	$78\% E_t$	ASHRAE 146
Heat pump pool heaters	All	—	4.0 COP	ARI 1160
Unfired storage tanks	All	—	Minimum insulation requirement R-12.5 (h- ft^2-°F)/Btu	(none)

For SI: °C = [(°F) - 32] / 1.8, 1 British thermal unit per hour = 0.2931 W, 1 gallon = 3.785 L, 1 British thermal unit per hour per gallon = 0.078 W/L.

a. Energy factor (EF) and thermal efficiency (E_t) are minimum requirements. In the EF equation, V is the rated volume in gallons.

b. Standby loss (SL) is the maximum Btu/h based on a nominal 70°F temperature difference between stored water and ambient requirements. In the SL equation, Q is the nameplate input rate in Btu/h. In the SL equation for electric water heaters, V is the rated volume in gallons. In the SL equation for oil and gas water heaters and boilers, V is the rated volume in gallons.

c. Instantaneous water heaters with input rates below 200,000 Btu/h must comply with these requirements if the water heater is designed to heat water to temperatures 180°F or higher.

505.2.2.2 Automatic lighting shutoff. Buildings larger than 5,000 square feet (465 m^2) shall be equipped with an automatic control device to shut off lighting in those areas. This automatic control device shall function on either:

1. A scheduled basis, using time-of-day, with an independent program schedule that controls the interior lighting in areas that do not exceed 25,000 square feet (2323 m^2) and are not more than one floor; or
2. An occupant sensor that shall turn lighting off within 30 minutes of an occupant leaving a space; or
3. A signal from another control or alarm system that indicates the area is unoccupied.

Exception: The following shall not require an automatic control device:

1. Sleeping unit (see Section 505.2.3).
2. Lighting in spaces where patient care is directly provided.
3. Spaces where an automatic shutoff would endanger occupant safety or security.

505.2.2.2.1 Occupant override. Where an automatic time switch control device is installed to comply with Section 505.2.2.2, Item 1, it shall incorporate an override switching device that:

1. Is readily accessible.
2. Is located so that a person using the device can see the lights or the area controlled by that switch, or so that the area being lit is annunciated.
3. Is manually operated.
4. Allows the lighting to remain on for no more than 2 hours when an override is initiated.
5. Controls an area not exceeding 5,000 square feet (465 m^2).

Exceptions:

1. In malls and arcades, auditoriums, single-tenant retail spaces, industrial facilities and arenas, where captive-key override is utilized, override time may exceed 2 hours.
2. In malls and arcades, auditoriums, single-tenant retail spaces, industrial facilities and arenas, the area controlled may not exceed 20,000 square feet (1860 m^2).

505.2.2.2.2 Holiday scheduling. If an automatic time switch control device is installed in accordance with Section 505.2.2.2, Item 1, it shall incorporate an automatic holiday scheduling feature that turns off all loads for at least 24 hours, then resumes the normally scheduled operation.

Exception: Retail stores and associated malls, restaurants, grocery stores, places of religious worship and theaters.

505.2.3 Sleeping unit. Sleeping units in hotels, motels, boarding houses or similar buildings shall have at least one master switch at the main entry door that controls all permanently wired luminaires and switched receptacles, except those in the bathroom(s). Suites shall have a control meeting these requirements at the entry to each room or at the primary entry to the suite.

505.2.4 Exterior lighting controls. Lighting for all exterior applications shall have automatic controls capable of turning off exterior lighting when sufficient daylight is available or when the lighting is not required during nighttime hours. Lighting not designated for dusk-to-dawn operation shall be controlled by an astronomical time switch. Lighting designated for dusk-to-dawn operation shall be controlled by an astronomical time switch or photosensor. Astronomical time switches shall be capable of retaining programming and the time setting during loss of power for a period of at least 10 hours.

Exception: Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security, or eye adaptation.

505.3 Tandem wiring. (Mandatory). The following luminaires located within the same area shall be tandem wired:

1. Fluorescent luminaires equipped with one, three or odd-numbered lamp configurations, that are recess-mounted within 10 feet (3048 mm) center-to-center of each other.
2. Fluorescent luminaires equipped with one, three or any other odd-numbered lamp configuration, that are pendant- or surface-mounted within 1 foot (305 mm) edge-to-edge of each other.

Exceptions:

1. Where electronic high-frequency ballasts are used.
2. Luminaires on emergency circuits.
3. Luminaires with no available pair in the same area.

505.4 Exit signs. (Mandatory). Internally illuminated exit signs shall not exceed 5 Watts per side.

505.5 Interior lighting power requirements. (Prescriptive). A building complies with this section if its total connected lighting power calculated under Section 505.5.1 is no greater than the interior lighting power calculated under Section 505.5.2.

505.5.1 Total connected interior lighting power. The total connected interior lighting power (watts) shall be the sum of the watts of all interior lighting equipment as determined in accordance with Sections 505.5.1.1 through 505.5.1.4.

Exceptions: The connected power associated with the following lighting equipment is not included in calculating total connected lighting power.

1. Specialized medical, dental and research lighting.
2. Professional sports arena playing field lighting.

3. Display lighting for exhibits in galleries, museums and monuments.
4. Sleeping unit lighting in hotels, motels, boarding houses or similar buildings.
5. Emergency lighting automatically off during normal building operation.

505.5.1.1 Screw lamp holders. The wattage shall be the maximum labeled wattage of the luminaire.

505.5.1.2 Low-voltage lighting. The wattage shall be the specified wattage of the transformer supplying the system.

505.5.1.3 Other luminaires. The wattage of all other lighting equipment shall be the wattage of the lighting equipment verified through data furnished by the manufacturer or other approved sources.

505.5.1.4 Line-voltage lighting track and plug-in busway. The wattage shall be the greater of the wattage of the luminaires determined in accordance with Sections 505.5.1.1 through 505.5.1.3 or 30 W/linear foot (98W/lin m).

505.5.2 Interior lighting power. The total interior lighting power (watts) is the sum of all interior lighting powers for all areas in the building covered in this permit. The interior lighting power is the floor area for each building area type listed in Table 505.5.2 times the value from Table 505.5.2 for that area. For the purposes of this method, an "area" shall be defined as all contiguous spaces that accommodate or are associated with a single building area type as listed in Table 505.5.2. When this method is used to calculate the total interior lighting power for an entire building, each building area type shall be treated as a separate area.

505.6 Exterior lighting. (Mandatory). When the power for exterior lighting is supplied through the energy service to the building, all exterior lighting, other than low-voltage landscape lighting, shall comply with Sections 505.6.1 and 505.6.2.

Exception: Where approved because of historical, safety, signage or emergency considerations.

505.6.1 Exterior building grounds lighting. All exterior building grounds luminaires that operate at greater than 100 watts shall contain lamps having a minimum efficacy of 60 lumens per watt unless the luminaire is controlled by a motion sensor or qualifies for one of the exceptions under Section 505.6.2.

TABLE 505.5.2
INTERIOR LIGHTING POWER ALLOWANCES

Building Area Type[a]	LIGHTING POWER DENSITY (W/ft^2)
Automotive Facility	0.9
Convention Center	1.2
Court House	1.2
Dining: Bar Lounge/Leisure	1.3
Dining: Cafeteria/Fast Food	1.4
Dining: Family	1.6
Dormitory	1.0
Exercise Center	1.0
Gymnasium	1.1
Healthcare-Clinic	1.0
Hospital	1.2
Hotel	1.0
Library	1.3
Manufacturing Facility	1.3
Motel	1.0
Motion Picture Theater	1.2
Multi-Family	0.7
Museum	1.1
Office	1.0
Parking Garage	0.3
Penitentiary	1.0
Performing Arts Theater	1.6
Police/Fire Station	1.0
Post Office	1.1
Religious Building	1.3
Retail[b]	1.5
School/University	1.2
Sports Arena	1.1
Town Hall	1.1
Transportation	1.0
Warehouse	0.8
Workshop	1.4

For SI: 1 foot = 304.8 mm, 1 watt per square foot = $W/0.0929\ m^2$.

a. In cases where both a general building area type and a more specific building area type are listed, the more specific building area type shall apply.

b. Where lighting equipment is specified to be installed to highlight specific merchandise in addition to lighting equipment specified for general lighting and is switched or dimmed on circuits different from the circuits for general lighting, the smaller of the actual wattage of the lighting equipment installed specifically for merchandise, or 1.6 W/ft^2 times the area of the specific display but not to exceed 50% of the floor area, or 3.9 W/ft^2 times the actual case or shelf area for displaying and selling jewelry, china or silver, shall be added to the interior lighting power determined in accordance with this line item.

505.6.2 Exterior building lighting power. The total exterior lighting power allowance for all exterior building applications is the sum of the individual lighting power allowances based on the densities permitted in Table 505.6.2 for these applications plus an additional unrestricted allowance of 5 percent of that sum. Tradeoffs are allowed only among exterior lighting applications listed in Table 505.6.2 in the Tradable Surfaces section. Exterior lighting for all applications (except those included in the exceptions to Section 505.6.2) shall comply with the requirements of Section 505.6.1.

Exceptions: Lighting used for the following exterior applications is exempt when equipped with a control device independent of the control of the nonexempt lighting:

1. Specialized signal, directional, and marker lighting associated with transportation;
2. Advertising signage or directional signage;
3. Integral to equipment or instrumentation and is installed by its manufacturer;
4. Theatrical purposes, including performance, stage, film production and video production;
5. Athletic playing areas;
6. Temporary lighting;
7. Industrial production, material handling, transportation sites, and associated storage areas;
8. Theme elements in theme/amusement parks; and
9. Used to highlight features of public monuments and registered historic landmark structures or buildings.

TABLE 505.6.2
LIGHTING POWER DENSITIES FOR BUILDING EXTERIORS

APPLICATIONS	LIGHTING POWER DENSITIES
Tradable Surfaces (Lighting Power Densities for uncovered parking areas, building grounds, building entrances and exits, canopies and overhangs, and outdoor sales areas may be traded.)	
Uncovered Parking Areas	
Parking Lots and drives	0.15 W/ft^2
Building Grounds	
Walkways less than 10 feet wide	1.0 watts/linear foot
Walkways 10 feet wide or greater, plaza areas and special feature areas	0.2 W/ft^2
Stairways	1.0 W/ft^2
Building Entrances and Exits	
Main entries	30 watts/linear foot of door width
Other doors	20 watts/linear foot of door width
Canopies and Overhangs	
Canopies (free standing & attached and overhangs)	1.25 W/ft^2
Outdoor Sales	
Open areas (including vehicle sales lots)	0.5 W/ft^2
Street frontage for vehicle sales lots in addition to "open area" allowance	20 watts/linear foot
Nontradable Surfaces (Lighting Power Density calculations for the following applications can be used only for the specific application and cannot be traded between surfaces or with other exterior lighting. The following allowances are in addition to any allowance otherwise permitted in the Tradable Surfaces section of this table.)	
Building facades	0.2 W/ft^2 for each illuminated wall or surface or 5.0 Watts/linear foot for each illuminated wall or surface length
Automated teller machines and night depositories	270 watts per location plus 90 watts per additional ATM per location
Entrances and gatehouse inspection stations at guarded facilities	1.25 W/ft^2 of uncovered area (covered areas are included in the Canopies and Overhangs section of Tradable Surfaces)
Loading areas for law enforcement, fire, ambulance and other emergency service vehicles	0.5 W/ft^2 of uncovered area (covered areas are included in the Canopies and Overhangs section of Tradable Surfaces)
Drive-up windows at fast food restaurants	400 watts per drive-through
Parking near 24-hour retail entrances	800 watts per main entry

For SI: 1 foot = 304.8 mm, 1 watt per square foot = W/0.0929 m^2.

505.7 Electrical energy consumption. (Mandatory). In buildings having individual dwelling units, provisions shall be made to determine the electrical energy consumed by each tenant by separately metering individual dwelling units.

SECTION 506
TOTAL BUILDING PERFORMANCE

506.1 General. The proposed design complies with this section provided that:

1. Sections 502.4, 502.5, 503.2, 504 505.2, 505.3, 505.4 505.6 and 505.7 are each satisfied, and
2. Annual energy costs of the proposed design as determined in accordance with Section 506.3 do not exceed those of the standard design as determined in accordance with Section 506.4.

506.2 Analysis procedures. Sections 506.2.1 through 506.2.8 shall be applied in determining total building performance.

506.2.1 Energy analysis. Annual (8,760 hours) energy costs for the standard design and the proposed design shall each be determined using the same approved energy analysis simulation tool.

506.2.2 Climate data. The climate data used in the energy analysis shall cover a full calendar year (8,760 hours) and shall reflect approved coincident hourly data for temperature, solar radiation, humidity and wind speed for the building location.

506.2.3 Energy rates. The annual energy costs shall be estimated using energy rates published by the serving energy supplier and which would apply to the actual building or *DOE State-Average Energy Prices* published by DOE's Energy Information Administration and which would apply to the actual building.

506.2.4 Nondepletable energy. Nondepletable energy collected off site shall be treated and priced the same as purchased energy. Energy from nondepletable energy sources collected on site shall be omitted from the annual energy cost of the proposed design. The analysis and performance of any nondepletable energy system shall be determined in accordance with accepted engineering practice using approved methods.

506.2.5 Building operation. Building operation shall be simulated for a full calendar year (8,760 hours). Operating schedules shall include hourly profiles for daily operation and shall account for variations between weekdays, weekends, holidays, and any seasonal operation. Schedules shall model the time-dependent variations of occupancy, illumination, receptacle loads, thermostat settings, mechanical ventilation, HVAC equipment availability, service hot water usage, and any process loads.

506.2.6 Simulated loads. The following systems and loads shall be modeled in determining total building performance: heating systems, cooling systems, fan systems, lighting power, receptacle loads, and process loads that exceed 1.0 W/ft^2 (W/0.0929 m^2) of floor area of the room or space in which the process loads are located.

Exception: Systems and loads serving required emergency power only.

506.2.7 Service water-heating systems. Service water-heating systems that are other than combined service hot water/space-heating systems shall be be omitted from the energy analysis provided all requirements in Section 504 have been met.

506.2.8 Exterior lighting. Exterior lighting systems shall be the same as in the standard and proposed designs.

506.3 Determining energy costs for the proposed design. Building systems and loads shall be simulated in the proposed design in accordance with Sections 506.3.1 and 506.3.2.

506.3.1 HVAC and service water-heating equipment. All HVAC and service water-heating equipment shall be simulated in the proposed design using capacities, rated efficiencies and part-load performance data for the proposed equipment as provided by the equipment manufacturer.

506.3.2 Features not documented at time of permit. If any feature of the proposed design is not included in the building permit application, the energy performance of that feature shall be assumed to be that of the corresponding feature used in the calculations required in Section 506.4.

506.4 Determining energy costs for the standard design. Sections 506.4.1 through 506.4.7 shall be used in determining the annual energy costs of the standard design.

506.4.1 Equipment efficiency. The space-heating, space-cooling, service water-heating, and ventilation systems and equipment shall meet, but not exceed, the minimum efficiency requirements of Sections 503 and 504.

506.4.2 HVAC system capacities. HVAC system capacities in the standard design shall be established such that no smaller number of unmet heating and cooling load hours and no larger heating and cooling capacity safety factors are provided than in the proposed design.

506.4.3 Envelope. The thermal envelope of the standard design shall comply with the prescriptive requirements of Sections 502.1 through 502.3, as well as the mandatory provisions of Sections 502.4 through 502.5.

506.4.4 Identical characteristics. The heating/cooling system zoning, the orientation of each building feature, the number of floors and the gross envelope areas of the standard design shall be the same as those of the proposed design except as modified by Section 506.4.5 or 506.4.6.

Exception: Permanent fixed or movable external shading devices for windows and glazed doors shall be excluded from the standard design.

506.4.5 Window area. The window area of the standard design shall be the same as the proposed design, or 35 percent of the above-grade wall area, whichever is less, and shall be distributed in a uniform pattern equally over each building facade.

506.4.6 Skylight area. The skylight area of the standard design shall be the same as the proposed design, or 3 percent of the gross area of the roof assembly, whichever is less.

506.4.7 Interior lighting. The lighting power for the standard design shall be the maximum allowed in accordance with Section 505.5. Where the occupancy of the building is not known, the lighting power density shall be 1.5 Watts per square foot (16.1 W/m^2).

506.5 Documentation. The energy analysis and supporting documentation shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. The information documenting compliance shall be submitted in accordance with Sections 506.5.1 through 506.5.4.

506.5.1 Annual energy use and associated costs. The annual energy use and costs by energy source of the standard design and the proposed design shall be clearly indicated.

506.5.2 Energy-related features. A list of the energy-related features that are included in the proposed design and on which compliance with the provisions of the code are claimed shall be provided to the code official. This list shall include and prominently indicate all features that differ from those set forth in Section 506.4 and used in the energy analysis between the standard design and the proposed design.

506.5.3 Input and output report(s). Input and output report(s) from the energy analysis simulation program containing the complete input and output files, as applicable. The output file shall include energy use totals and energy use by energy source and end-use served, total hours that space conditioning loads are not met and any errors or warning messages generated by the simulation tool as applicable.

506.5.4 Written explanation(s). An explanation of any error or warning messages appearing in the simulation tool output shall be provided in a written, narrative format.

CHAPTER 6
REFERENCED STANDARDS

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 107.

AAMA

American Architectural Manufacturers Association
1827 Walden Office Square
Suite 550
Schaumburg, IL 60173-4268

Standard reference number	Title	Referenced in code section number
AAMA/WDMA/CSA 101/I.S.2/a440—05	Specifications for Windows, Doors and Unit Skylights	402.4.2, 502.4.1

AMCA

Air Movement and Control Association International
30 West University Drive
Arlington Heights, IL 60004-1806

Standard reference number	Title	Referenced in code section number
500D—98	Laboratory Methods for Testing Dampers for Rating	502.4.4

ANSI

American National Standards Institute
25 West 43rd Street
Fourth Floor
New York, NY 10036

Standard reference number	Title	Referenced in code section number
Z21.10.3—01	Gas Water Heaters, Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating Tank and Instantaneous—with Addenda Z21.10.3a-2003 and Z21.10.3b-2004	Table 504.2
Z21.13—04	Gas-Fired Low Pressure Steam and Hot Water Boilers	Table 503.2.3(5)
Z21.47—03	Gas-Fired Central Furnaces	Table 503.2.3(4)
Z83.8—02	Gas Unit Heaters and Gas-Fired Duct Furnaces—with Addendum Z83.8a-2003	Table 503.2.3(4)

ARI

Air Conditioning and Refrigeration Institute
4301 North Fairfax Drive
Suite 200
Arlington, VA 22203

Standard reference number	Title	Referenced in code section number
210/240—03	Unitary Air-Conditioning and Air-Source Heat Pump Equipment	Table 503.2.3(1), Table 503.2.3(2)
310/380—93	Standard for Packaged Terminal Air-Conditioners and Heat Pumps	Table 503.2.3(3)
340/360—2000	Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment	Table 503.2.3(1), Table 503.2.3(2)
365—02	Commercial and Industrial Unitary Air-Conditioning Condensing Units	Table 503.2.3(6)
460-00	Remote Mechanical-Draft Air-Cooled Refrigerant Condensers	Table 503.2.3(11)
550/590—98	Water Chilling Packages Using the Vapor Compression Cycle—with Addenda	Table 503.2.3(7)
560—00	Absorption Water Chilling and Water Heating Packages	Table 503.2.3(7)
13256-1 (2004)	Water-source Heat Pumps—Testing and Rating for Performance—Part 1: Water-to-air and Brine-to-air Heat Pumps	Table 503.2.3(2)
1160—2004	Performance Rating of Heat Pump Pool Heaters	Table 504.2

ASHRAE

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
1791 Tullie Circle, NE
Atlanta, GA 30329-2305

Standard reference number	Title	Referenced in code section number
119—88 (RA 1994)	Air Leakage Performance for Detached Single-family Residential Buildings	Table 404.5.2(1)
146-1998	Testing and Rating Pool Heaters	Table 504.2
13256-1 (2004)	Water-source Heat Pumps—Testing and Rating for Performance—Part 1: Water-to-air and Brine-to-air Heat Pumps (ANSI/ASHRAE/IESNA 90.1-2004)	Table 503.2.3(2)
90.1—2004	Energy Standard for Buildings Except Low-rise Residential Buildings (ANSI/ASHRAE/IESNA 90.1-2004)	501.1, 501.2, 502.1.1, Table 502.2(2)
ASHRAE—2001	ASHRAE Handbook of Fundamentals-2004	402.1.4, Table 404.5.2(1), 503.2.1
ASHRAE—2004	ASHRAE HVAC Systems and Equipment Handbook-2004	503.2.1

ASME

American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Standard reference number	Title	Referenced in code section number
PTC 4.1 - 1964	Steam Generating Units	Table 503.2.3(5)

ASTM

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2859

Standard reference number	Title	Referenced in code section number
C 90—03	Specification for Load-bearing Concrete Masonry Units	Table 502.2(1)
E 96—00e01	Standard Test Methods for Water Vapor Transmission of Materials	202, 502.5
E 283—04	Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen	402.4.3, 502.4.2, 502.4.7

CSA

Canadian Standards Association
5060 Spectrum Way
Mississauga, Ontario, Canada L4W 5N6

Standard reference number	Title	Referenced in code section number
101/I.S.2/A440—05	Specifications for Windows, Doors and Unit Skylights	402.4.2, 502.4.1

CTI

Cooling Technology Institute
2611 FM 1960 West, Suite H-200
Houston, TX 77068-3730

Standard reference number	Title	Referenced in code section number
ATC-105 (2000)	Acceptance Test Code	Table 503.2.3(11)
STD-201 (2002)	Certification Standard for Commercial Water Cooling Towers	Table 503.2.3(11)

DOE

U.S. Department of Energy
c/o Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402-9325

Standard reference number	Title	Referenced in code section number
10 CFR Part 430, Subpart B, Appendix E (1998)	Uniform Test Method for Measuring the Energy Consumption of Water Heaters	Table 504.2
10 CFR Part 430, Subpart B, Appendix N (1998)	Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers	Table 503.2.3(4), Table 503.2.3(5)
DOE/EIA—0376 (Current Edition)	State Energy Prices and Expenditure Report	404.3, 506.2.3

HI

Hydronics Institute, Division of the Gas Appliance Manufacturers Association
P.O. Box 218
Berkeley Heights, NJ 07054

Standard reference number	Title	Referenced in code section number
HBS	I=B=R—Testing and Rating Standard for Heating Boilers, 1989 Ed.	Table 503.2.3(5)

ICC

International Code Council, Inc.
500 New Jersey Avenue, NW
6th Floor
Washington, D.C. 20001

Standard reference number	Title	Referenced in code section number
IBC—06	International Building Code®	102.2, 201.3
ICC EC—06	ICC Electrical Code®	201.3
IFC—06	International Fire Code®	201.3
IFGC—06	International Fuel Gas Code®	201.3
IMC—06	International Mechanical Code®	503.2.5, 503.2.6, 503.2.7.1, 503.2.7.1.1, 503.2.7.1.2, 503.2.9.1, 503.3.1, 503.4.5
IPC—06	International Plumbing Code®	201.3
IRC—06	International Residential Code®	201.3, 403.2.2, 403.6, 404.6.1, Table 404.5.2(1)

IESNA

Illuminating Engineering Society of North America
120 Wall Street, 17th Floor
New York, NY 10005-4001

Standard reference number	Title	Referenced in code section number
90.1-2004	Energy Standard for Buildings Except Low-rise Residential Buildings	501.1, 501.2, 502.1.1, Table 502.2(2)

NFRC

National Fenestration Rating Council, Inc.
8484 Georgia Avenue
Suite 320
Silver Spring, MD 20910

Standard reference number	Title	Referenced in code section number
100—01	Procedure for Determining Fenestration Product U-Factors—Second Edition	102.1.3
200—01	Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence—Second Edition	102.1.3
400—01	Procedure for Determining Fenestration Product Air Leakage—Second Edition	402.4.2, 502.4.1

SMACNA

Sheet Metal and Air Conditioning Contractors National Association, Inc.
4021 Lafayette Center Drive
Chantilly, VA 20151-1209

Standard reference number	Title	Referenced in code section number
SMACNA—85	HVAC Air Duct Leakage Test Manual	503.2.7.1.3

UL

Underwriters Laboratories Inc.
333 Pfingsten Road
Northbrook, IL 60062-2096

Standard reference number	Title	Referenced in code section number
181A—98	Closure Systems for Use with Rigid Air Ducts and Air Connectors — with Revisions through December 1998.	503.2.7
181B—95	Closure Systems for Use with Flexible Air Ducts and Air Connectors —with Revisions through August 2003	503.2.7
727—98	Oil-Fired Central Furnaces—with Revisions through January 2001	Table 503.2.3(4)
731—95	Oil-Fired Unit Heaters—with Revisions through January 1999.	Table 503.2.3(4)

WDMA

Window and Door Manufacturers Association
1400 East Touhy Avenue, Suite 470
Des Plaines, IL 60018

Standard reference number	Title	Referenced in code section number
101/I.S.2/A440—05	Specifications for Windows, Doors and Unit Skylights	402.4.2, 502.4.1

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EDITORIAL CHANGES – SECOND PRINTING

Page 24, Table 404.5.2(1): column 2, row 10, line 11 now reads . . . SHGC: From Table 402.1.1 except that for climates with

EDITORIAL CHANGES – THIRD PRINTING

Page 24, Table 404.5.2(1): column 2, row 9, lines 10 and 11 now read . . . U-factor: from Table 402.1.3; SHGC: From Table 402.1.1 except that for climates with

Page 56, ASHRAE: column 1, row 7 now reads . . . ASHRAE—2001

Page 57, IESNA: column 1, now reads . . . 90.1-2004

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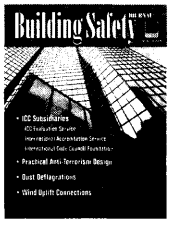


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